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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 15
AUGUST 1, 1973

W73-09101 -- W73-09750

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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VOLUME 6, NUMBER 15
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W73-09101 -- W73-09750

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

For primary bibliographic entry sde Field 02F.

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

DIFFUSION IN DILUTE POLYMETRIC SOLUTIONS,
Delaware Univ., Newark. Dept of Chemical Engineering.
H. R. Oamers, and A. B. Metzner.
Industrial and Engineering Chemistry Fundamentals, Vol 11, No 2, p 161-169, May, 1972. 4 fig, 4 tab, 58 ref. OWRR A-005-DEL (6).

Descriptors: *Diffusion, *Aqueous solutions, Diffusivity, Water properties, Water chemistry, Viscosity, Thermodynamics.
Identifiers: *Polymer solutions.

The mutual diffusivity of three liquid solutes in two dilute aqueous polymeric solutions was measured as a function of polymer concentration. Solute diffusivities never deviated from that in the pure solvent by more than 20% and were always smaller. This is in contrast to expectations that mass transfer of solutes in solvents might increase significantly on addition of small amounts of polymer. The data are correlated by a thermodynamic model in which the easily measured excess volume of mixing polymer and solvent is the principal parameter. Data for the concentration dependence of the diffusivity of polyacrylonitrile in dimethylformamide are presented. These suggest the need for inclusion of additional molecular parameters in polymer diffusion theories. (Knapp-USGS)
W73-09134

LINEAR STABILITY OF PLAIN POISEUILLE FLOW OF VISCOELASTIC LIQUIDS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 02E.
W73-09431

CATALYTIC OXIDATION OF PHENOL OVER COPPER OXIDE IN AQUEOUS SOLUTION,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-09587

EVAPORATION OF WATER FROM AQUEOUS INTERFACES,
Rochester Inst. of Tech., N.Y.
For primary bibliographic entry see Field 03A.
W73-09625

02. WATER CYCLE

2A. General

HYDROLOGIC SIMULATION OF DEPRESSIONAL WATERSHEDS,
Iowa State Water Resources Research Inst., Ames.
K. L. Campbell, and H. P. Johnson.
Project Completion Report ISWRRI-48, December 1972. 215 p, 45 fig, 2 tab, 59 ref, append. OWRR B-025-IA (1) 14-31-0001-3588.

Descriptors: *Water balance, *Rainfall-runoff relationships, *Simulation analysis, *Drainage practices, *Depression storage, *Iowa, Storage, Mathematical models, Interception, Infiltration, Recharge, Evaporation, Evapotranspiration, Soil water movement, Routing.

A mathematical model was developed to simulate watersheds in flat areas with many surface depressions and indicate the response due to watershed changes. The model, which simulates the watershed discharge and soil moisture status continuously throughout the crop season is based on a single-storm hydrologic model and uses daily pan evaporation and time-depth precipitation records as input. It simulates the processes of interception, surface storage, infiltration, surface runoff, soil profile storage, percolation to the water table, subsurface tile drainage, soil moisture redistribution, evapotranspiration, depression routing, tile-main routing, and drainage ditch routing. The resulting outputs are daily evapotranspiration, soil moisture status in the crop root zone, and watershed discharge. The hydrology of the East Fork Hardin Creek watershed near Jefferson, Iowa (with a drainage area of 24 sq mi) was simulated. The model satisfactorily simulated the watershed discharge and soil moisture status. (Knapp-USGS)
W73-09101

THE TRANSIENT BEHAVIOR OF RECHARGE--DISCHARGE AREAS IN REGIONAL GROUNDWATER SYSTEMS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W73-09105

A BAYESIAN APPROACH TO AUTOCORRELATION ESTIMATION IN HYDROLOGIC AUTOREGRESSIVE MODELS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
R. L. Lenton, I., Rodriguez-Iturbe, and J. C. Schaake, Jr.
Available from the National Technical Information Service as PB-220 354, $3.00 in paper copy, $0.95 in microfiche. Partial Completion Report 163, January 1973. 121 p, 24 fig, 12 tab, 32 ref, 2 append. OWRR C-4118 (9021) (1).

Descriptors: Statistical methods, *Correlation analysis, *Time series analysis, Stochastic processes, *Synthetic hydrology, Monte Carlo method, Risks, Uncertainty, *Model studies.
Identifiers: *Bayes estimators, Estimation theory, Loss function.

Three general approaches leading to the marginal posterior probability distribution function for the autocorrelation coefficient of the first order annual autoregressive model are presented, based on varying assumptions about the incidental parameters of the model. The performance of the Bayes estimators for the quadratic, symmetric, linear and asymmetric linear loss functions is evaluated by Monte Carlo methods, and compared to the performance of some classical estimators, under the expected risk criterion and for conditions of limited data. The robustness of the Bayes estimator under changes of the loss function is also determined. The general framework for the derivation of a loss function for a hydrologic design problem is presented.
W73-09120

WATER BALANCE IN NORTH AMERICA (VODNYY BALANS SEVERNOY AMERIKI),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
N. N. Dreyer.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 1, p 108-118, January-February 1972. 7 fig, 1 tab, 16 ref.

Descriptors: *Water balance, *Water resources, *North America, United States, Canada, Mexico, Hydrologic cycle, Inflow, Discharge (Water), Precipitation (Atmospheric), Runoff, Evaporation, River basins, Maps, Estimating.
Identifiers: *USSR.

Water resources of North America have been studied in considerable detail except for northern Alaska, the Arctic Archipelago, and northwestern regions of Canada. On the basis of American and Canadian water-supply papers and Soviet maps prepared from American, Canadian, and Mexican atlases, water-balance equations were developed for 80 river basins in Canada and for 135 river basins in the United States, including 10 in Alaska. The components of the water balance examined are precipitation; total runoff, including outflow due to subsurface seepage; total evaporation; and total moisture. Rough estimates of the water resources of North and Central America are tabulated. (Josefson-USGS)
W73-09158

WATER RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1973.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W73-09278

CONCEPTS OF KARST DEVELOPMENT IN RELATION TO INTERPRETATION OF SURFACE RUNOFF,
Geological Survey, Raleigh, N.C.

W73-09294

DESCRIPTION AND HYDROLOGIC ANALYSIS OF TWO SMALL WATERSHEDS IN UTAH'S WASATCH MOUNTAINS,
Forest Service, (USDA), Logan, Utah. Intermountain Forest and Range Experiment Station.
R. S. Johnston, and R. D. Doty.
USDA Forest Serv. Res. Pap. INT-127, July 1972. 53 p, Illus.

Descriptors: *Hydrologic data, Transpiration, *Streamflow, *Climatic data, *Water yield improvement, Rainfall-runoff relationships, Snowmelt, Snow packs, Air temperature, Water temperature, Water chemistry, Sediment yields, Evapotranspiration, Vegetation, Geology, Soils, Soil water, *Utah, *Small watersheds.
Identifiers: Experimental watersheds, Aspen.

The climate, geology, soils, and vegetation are included in a description of two small watersheds characteristic o the high-elevation aspen type of northern Utah. Precipitation, soil-water use, evapotranspiration, and quantity and quality of streamflow on these relatively undisturbed catchments are graphically illustrated and discussed. These data permit pretreatment calibration of these watersheds. This thorough inventory will allow a sensitive, multi-resource analysis of planned treatments designed to increase water yields.
W73-09378

MORPHOMETRY OF THREE SMALL WATERSHEDS, BLACK HILLS, SOUTH DAKOTA AND SOME HYDROLOGIC IMPLICATIONS,
Forest Service, (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
T. Yamamoto, and H. K. Orr.

Descriptors: *Geomorphology, *Hydrogeology, *Geologic control, *Water yield, *Dimensional analysis, Hydrology, Peak discharge, Topography, *Small watersheds, Drainage basins.
Identifiers: *Forested watersheds, *Ponderosa pine, Black Hills.

Morphometry of three small contiguous watersheds together with their hydrologic character is analyzed in terms of dimensional anal-

ysis and similitude concepts. Within this framework it has been found that maximum length of master watershed and average relief of first order basins scale, most nearly the same as volume yield and stormflow peaks. Therefore these variables are better indicators of relative water yield, for example, than is 'area' on the hard rock of the laccolith on which the study watersheds are located. These relationships need to be further tested under conditions of different parent rock and climate.
W73-09382

A LOSING DRAINAGE BASIN IN THE MISSOURI OZARKS IDENTIFIED ON SIDE-LOOKING RADAR IMAGERY,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 07B.
W73-09446

WORLD WATER BALANCE (MICROVOY VODNYY BALANS),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
M. I. L'vovich.
Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva, Vol 102, No 4, p 314-324, July-August 1970. 6 tab, 83 ref.

Descriptors: *Water balance, *Hydrologic cycle, *Water resources, Precipitation (Atmospheric), Runoff, Evaporation, Oceans, Land, Water utilization, Water conservation, Conferences.
Identifiers: *USSR, *Global water balance, Hydrosphere.

Discussion of general problems of global water balance and tabulation of the total amount of water in the Earth system and of its movement through the world hydrological cycle are based on a paper presented at the International Symposium on Water Balance of the World, held in Reading, England, 1970. A rough approximation of world water resources for the year 2000 shows that the greatest threat to water conservation lies in the utilization of rivers, lakes, and reservoirs for waste-water removal and treatment. Adoption of more rational principles of water conservation and use can provide a basis for the protection of water from depletion and lessen the prospects of a water crisis. (Josefson-USGS)
W73-09459

PAPERS BY YOUNG SCIENTISTS (DOKLADY MOLODYKH SPETSIALISTOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 204, Grushevskiy, M. S., and Ivanova, A. A., editors, Leningrad, 1972. 152 p.

Descriptors: *Hydrology, *Investigations, Channels, Rivers, Estuaries, Surges, Dunes, Sediments, Sediment transport, Meteorology, Atmosphere, Ice cover, Heat balance, Soil moisture, Evaporation, Evaporation pans, Measurement, Aerial photography, Correlation analysis, Equations.
Identifiers: *USSR, Heat exchange, Isobaths, Nomograms.

This collection contains papers presented at a conference of young scientists, held at the State Hydrologic Institute in Leningrad, April 12-14, 1971. The papers present the results of theoretical, laboratory, and field investigations in different branches of hydrology. The subjects examined include: (1) optimal spatial interpolation at various distances between precipitation stations; (2) quantitative criteria of channel macroforms; (3) similitude criteria of channel deformations in a shoal type of channel process; (4) dune movement of coarse sediments; (5) evaporation from soil surfaces; (6) evaporation measurement by pans; (7) heat exchange in rivers during cooling and freezing; and (8) influence of man on changes in river regime and natural conditions. (Josefson-USGS)
W73-09463

GENERAL REPORT ON WATER RESOURCES SYSTEMS: OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
V. T. Chow.
Paper presented at International Symposium on Mathematical Models in Hydrology, July 26-31, 1971, Warsaw, Poland: International Association of Scientific Hydrology, 1971. 9 p, 4 ref. OWRR B-060-ILL (1).

Descriptors: *Hydraulic models, *Hydrologic data, *Data collections, Analytical techniques, Synthetic hydrology, Model studies, Reservoir operation, Streamflow, Channel morphology, Flood control, Mathematical studies, Systems analysis, Input-output analysis, Statistical methods, Methodology, Reviews, Conferences.

For the optimization of a tangible water resources system, two categories of modelling techniques may be distinguished; namely, the analytical technique and the simulation technique. The analytical technique is to convert the optimization problem to a mathematical model which can be solved by an analytical optimization method. Structuring of the model, or modelling, begins with the selection of the physical variables for which an optimum quantity is desired, such as reservoir size, flood channel capacity, and hydropower plant scale. Mathematical expressions consisting of objective functions and constraints are then formulated to express the physical relationships among the variables and limit the range of values that given variables may assume. The simulation technique is a direct simulation of the system and its functioning, therefore offering great freedom and flexibility in modelling. Systems sensitivity to a particular input, transfer function, or policy feature is readily ascertained. The simulation technique thus avoids the difficulty of the analytical technique in condensing mathematical formulations describing the functioning of a prototype system into a form solvable by available analytical optimization methods. Five papers are reviewed in this general report. (Woodard-USGS)
W73-09588

MAKARA, IHD EXPERIMENTAL BASIN NO 6, 1968-1970,
National Water and Soil Conservation Organization, Wellington (New Zealand).
M. E. Yates.
New Zealand Ministry of Works Hydrological Research Annual Report No 23, 1972. 54 p, 14 fig, 18 tab, 3 ref, 5 append.

Descriptors: *Land management, *Soil-water-plant relationships, *Hydrologic data, *Vegetation, Foreign countries, International Hydrological Decade, Projects, Reviews, Data collections, Grasses, Growth rates, Trees, Soil types, Soil moisture, Precipitation (Atmospheric), Temperature, Land development.
Identifiers: *Makara experimental basin (N.Z.), *New Zealand.

Under the auspices of the International Hydrological Decade the Ministry of Works is establishing a network of experimental basins to study the hydrological characteristics of important soil and vegetation complexes of New Zealand. Studies of the effect of cultural change on these characteristics are included. This is the second annual research report for Makara, the first begin published in 1970. The Makara experimental basin is situated on the west coast of the southern tip of the North Island and is 8 kilometers in a direct line west-northwest of Willington City. In broad terms the objective at Makara is the investigation of the effect of land use and land management practices on the hydrological regimen of stable central yellow-brown earths. In 1970, projects included work with unimproved exotic pasture; improved pasture--by oversowing and topdressing; improved pasture--by cultivation, sowing and topdressing; cropping; exotic forest; and retirement for regeneration of badly depleted indigenous forest. Data are included concerning types of vegetation, vegetation growth rates, soil types, topography, rainfall, runoff, winds, temperature, and other related information. (Woodard-USGS)
W73-09596

MOUTERE, IHD EXPERIMENTAL BASIN NO 8, 1971,
National Water and Soil Conservation Organization, Wellington (New Zealand).
F. Scarf.
New Zealand Ministry of Works Hydrological Research Annual Report No 22, 1972. 16 p, 11 fig, 5 tab, 1 ref, 1 append.

Descriptors: *Land management, *Soil-water-plant relationships, *Vegetation, Plant growth, *Soil environment, Foreign countries, International Hydrological Decade, Rainfall, Runoff, Soil moisture, Climatic data, Data collections, Correlation analysis.
Identifiers: *Moutere experimental basin (N.Z.), New Zealand.

Under the auspices of the International Hydrological Decade the Ministry of Works is establishing a network of experimental basins to study the hydrological characteristics of important soil and vegetation complexes of New Zealand. Studies of the effect of cultural change on these characteristics are included. This is the sixth annual research report for Moutere. The present catchment cultural change program has been in operation since 1970. Pictures, tables of data, and illustrations describe vegetation types, vegetation growth rates, rainfall, runoff, soil moisture, and other related data concerned with land management projects in the area. (Woodard-USGS)
W73-09597

REMOTE SENSING AND DATA HANDLING--THEIR APPLICATION TO WATER RESOURCES,
International Business Machines Corp., Gaithersburg, Md.
For primary bibliographic entry see Field 07B.
W73-09673

2B. Precipitation

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA WATER YEAR 1972.
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W73-09107

WEATHER MODIFICATION: PRECIPITATION INDUCEMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 03B.
W73-09114

A FIELD INVESTIGATION AND NUMERICAL SIMULATION OF COASTAL FOG,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
E. J. Mack, W. J. Eadie, C. W. Rogers, and R. J. Pilie.

National Aeronautics and Space Administration Contractor Report CR-2201, February, 1973. 136 p, 40 fig, 5 tab, 23 ref, 1 append.

Descriptors: *Fog, *Coasts, *California, Investigations, Meteorological data, Data collections, Numerical analysis, Correlation analysis, Condensation, Moisture content, Water vapor, Climatology, Weather forecasting, Temperature, Dew point, Winds, Drops (Fluids), Methodology, Model studies.
Identifiers: *Coastal fog, *Los Angeles area (Calif).

A field investigation of the microphysical and micrometeorological features of fogs occurring near Los Angeles and Vandenburg, California, included observations of windspeed and direction, temperature, dewpoint, vertical wind velocity, dew deposition, drop-size distribution, liquid water content, and haze and cloud nucleus concentration. These observations were initiated in late evening prior to fog formation and continued until the time of dissipation in both advection and radiation fogs. Data were acquired also in one valley fog and several dense haze situations. The behavior of these parameters prior to and during fog are discussed in detail. A two-dimensional numerical model was developed to investigate the formation and dissipation of advection fogs under the influence of horizontal variations in surface temperature. The model predicts the evolution of potential temperature, water vapor content, and liquid water content in a vertical plane as determined by vertical turbulent transfer and horizontal advection. Results are discussed from preliminary numerical experiments on the formation of warm-air advection fog and dissipation by natural and artificial heating from the surface. (Woodard-USGS)
W73-09122

EVAPOTRANSPIRATION BY SUGAR CANE AS INFLUENCED BY METEOROLOGICAL FACTORS,
Hawaii Univ., Honolulu. Dept of Geography.
For primary bibliographic entry see Field 02D.
W73-09137

THE CHANGE OF PRECIPITATION CURRENT AFTER A SUDDEN CHANGE OF ELECTRIC FIELD IN A TROPICAL THUNDERSTORM,
University of Western Ontario, London. Dept. of Physics.
D. R. Lane-Smith.
Journal of Geophysical Research, Vol 77, No 12, p 2151-2155, April 20, 1972. 3 fig, 1 tab, 9 ref.

Descriptors: *Rainfall intensity, *Electric fields, *Thunderstorms, Meteorological data, Drops (Fluids), Effective precipitation, Cloud physics, Storm structure.
Identifiers: *Sierra Leone, Tropical thunderstorm.

Measurements were made of electric field, precipitation current, rainfall, and speed and direction of wind, in Sierra Leone during tropical thunderstorms. The response of precipitation current to sudden changes of electric field produced by lightning was analyzed for three different storms. The turbulent diffusion of charged droplets is suggested as the mechanism that produced the observed effects. When a sudden change occurs in an electric field, there is a sudden change in the charge of the produced droplets. This shift is reflected in the precipitation current with a time constant of about 3 seconds. A graph shows a typical meteorological record of the passage of a tropical thunderstorm. (Lang-USGS)
W73-09145

A MODEL FOR IN-CLOUD SCAVENGING OF COSMOGENIC RADIONUCLIDES,
Battelle-Pacific Northwest Labs., Richland, Wash.
W. E. Davis.
Journal of Geophysical Research, Vol 77, No 12, p 2159-2165, April 20, 1972. AEC (45-1)-1830.

Descriptors: *Radioisotopes, *Air circulation, *Fallout, Air-water interfaces, Cloud physics, Precipitation, Model studies, Climatic data, *Washington.
Identifiers: *Cosmogenic radionuclides, Bomb debris, Cloud scavenging.

Many natural trace elements are picked up by cloud water and deposited in precipitation. Bomb debris in precipitation, through in-cloud scavenging, can be a threat to man by similar process. This paper describes a study of the problem. Results are presented from a model developed to evaluate deposition of cosmogenic radionuclides picked up by cloud water. The results are an in-cloud scavenging coefficient of less than 0.0001 per sec and less than 0.001 per sec for C1-38 and C1-39. (Lang-USGS)
W73-09146

A SELECTED ANNOTATED BIBLIOGRAPHY OF THE CLIMATE OF THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
For primary bibliographic entry see Field 02H.
W73-09149

ROLE OF SEA SALTS IN THE SALT COMPOSITION OF RAIN AND RIVER WATERS,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02K.
W73-09152

CHARACTER OF SUMMER PRECIPITATION IN EAST SIBERIA (O PRIRODE LETNIKH OSADKOV VOSTOCHNOY SIBIRI),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
G. N. Vitvitskiy.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 1, p 93-99, January-February 1972. 3 tab.

Descriptors: *Precipitation (Atmospheric), *Summer, *Meteorology, Atmosphere, Water vapor, Winds, Air circulation, Atmospheric pressure, Isobars, Mapping.
Identifiers: *USSR (East Siberia), Isohypses.

Most precipitation in East Siberia is associated with the warm season of the year, with about 40% of the annual total occurring in July and August. In the lower half of the troposphere, the transport of water vapor eastward and northward predominates, with the eastward transport generally greater than the northward. The predominance of eastward transport is further proof that water vapor from the adjoining seas of Okhotsk and Japan contributes little to moisture circulation over East Siberia. (Josefson-USGS)
W73-09157

RAINFALL EFFECT ON SHEET FLOW OVER SMOOTH SURFACE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-09273

THE CLIMATE OF AN ORANGE ORCHARD: PHYSICAL CHARACTERISTICS AND MICROCLIMATE RELATIONSHIPS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 03F.
W73-09320

A RAINFALL CLIMATOLOGY OF HILO, HAWAII,
Hawaii Univ., Hilo. Cloud Physics Observatory.
C. M. Fullerton.
Available from the National Technical Information Service as PB-220 573, $3.00 in paper copy, $0.95 in microfiche. Hawaii University Water Resources Research Center, Honolulu, Technical Report No 61 (UHMET 72-03), December 1972. 34 p, 20 fig, 3 tab, 8 ref. OWRR B-024-HI (1).

Descriptors: *Rainfall, *Meteorology, *Rainfall intensity, *Hawaii, Rainfall disposition, Data collections, Rain gages, Frequency analysis, Time series analysis.
Identifiers: *Hilo (Hawaii).

Annual, monthly, and hourly rainfall data for Hilo, Hawaii, are plotted and analyzed as a preliminary phase of the study of space-time variations in high intensity rainfall. A summary of the Hilo climate is provided. Annual rainfall amounts are highly variable, while the annual rainfall frequency remains relatively constant at about 33%. Monthly rainfall and maximum 24-hour rainfall amounts are displayed in a monthly rainfall expectancy graph. Hourly rainfall amounts are divided into four intensity categories: 0.01-0.24, 0.25-0.49, 0.50-0.99, and> 1.00 inches per clock hour. The percentage distribution of annual and monthly rainfall amounts and frequencies by rainfall intensity category are plotted and discussed. Hourly data are displayed in a series of monthly diurnal distributions by rainfall intensity category. (Woodard-USGS)
W73-09585

CLIMATE OF THE POTOMAC RIVER BASIN AND CLIMATOLOGICAL SUMMARIES FOR SPRUCE KNOB, WARDENSVILLE, ROMNEY AND MARTINSBURG, WEST VIRGINIA,
West Virginia Univ., Morgantown.
R. O. Weedfall, W. H. Dickerson, M. S. Baloch, and E. N. Henry.
Available from NTIS, Springfield, Va 22151 COM-72-11334 Price $3.00 printed copy; 95 cents microfiche. West Virginia University Water Research Institute, Morgantown, Information Report 6, 1972. 15 p, 3 fig, 7 tab.

Descriptors: *Climatology, *Potomac River, *Climatic data, *West Virginia, Precipitation (Atmospheric), Temperature, Evaporation, Topography, Elevation, Data collections, Weather data, Meteorological data.

The general climate of the Potomac River basin is classified as semi-humid continental because of its relatively high and generally evenly distributed precipitation and its marked temperature contrasts between summer and winter. The West Virginia part of the basin includes a small part of the broad, fertile Shenandoah Valley. Eight of the States 55 counties cover a 3490.26 square mile area in the basin. Climatological summaries are presented for Spruce Knob, Wardensville, Romney and Martinsburg, West Virginia. Temperature and precipitation means and extremes are shown for the period 1931-1970 or portions thereof. Data tables also show total monthly precipitation at Wardensville (1931-1970) and average temperature and average pan evaporation for the same area. In addition, departures in inches from normal growing season rainfall and probabilities of low temperatures in spring and fall at selected locations are tabulated. (Woodard-USGS)
W73-09602

SNOW CRYSTAL FORMS AND THEIR RELATIONSHIP TO SNOWSTORMS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
For primary bibliographic entry see Field 02C.
W73-09610

A RELATIONSHIP BETWEEN SNOW ACCUMULATION AND SNOW INTENSITY AS DETERMINED FROM VISIBILITY,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 02C.
W73-09612

APPROACHES TO MEASURING 'TRUE' SNOWFALL,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 02C.
W73-09613

GLOBOSCOPE - A NEW LOOK AROUND,
West Virginia Univ., Morgantown. Div of Forestry.
D. A. Morgan.
West Virginia Agriculture and Forestry, Vol 4, No 4, p 2-5, September 1972. 7 fig, 5 ref. OWRR A-020-WVA (1).

Descriptors: *Local precipitation, *Gaging stations, *Cameras, *Terrain analysis, Rainfall, Winds, Climatology, Rain gages, *West Virginia, Instrumentation, Measurement, Ecology, Forests.
Identifiers: Site description, *Gage exposure, Photographic devices, Stereographic projections, Paraboloidal mirrors.

A unique photographic device was developed to provide a routine objective method of recording and evaluating the exposure of precipitation gages. The photographs are precise stereographic projections of the celestial hemisphere taken from a paraboloidal mirror. Vertical and horizontal angles to obstructions in the vicinity of a gage (to 12 degrees below the horizontal) can be measured directly from the projections. In conjunction with a zenith angle grid system, or a sun path chart, useful application possibilities for globescope technology exist in ecology, forestry, architecture, climatology, and related fields. (Chang-West Virginia)
W73-09620

ELEVATION IN WEST VIRGINIA,
West Virginia Univ., Morgantown.
R. Lee, M. Chang, and R. Calhoun.
West Virginia Agriculture and Forestry, Vol 5, No 1, p 5-9, January 1973. 5 fig, 3 tab, 5 ref. OWRR A-020-WVA (2).

Descriptors: *Topography, *Elevation, *Terrain analysis, Geomorphology, Climatology, Mountains, *Climatic zones, Orography, *West Virginia, Topographic mapping, *Appalachian Mountain Region.
Identifiers: Terrain climatology.

The vertical distribution of land in West Virginia was determined from a systematic sample of elevations at 2.5-minute intervals of latitude and longitude. The mean, median, and extreme elevations, and the total relief were computed for the State, and for each of its 55 counties. The data were shown to be useful in the delineation of climatological zones, in the estimation of mean annual temperature and precipitation, and in the assessment of terrain influences in agriculture, forestry, hydrology, and related endeavors.
W73-09621

2C. Snow, Ice, and Frost

IRON IN SURFACE AND SUBSURFACE WATERS, GRIZZLEY BAR, SOUTHEASTERN ALASKA,
Alaska Univ., College. Dept. of Geology.
For primary bibliographic entry see Field 05A.
W73-09111

SEDIMENTATION AND PHYSICAL LIMNOLOGY IN PROGLACIAL MALASPINA LAKE, ALASKA,
Massachusetts Univ., Amherst. Coastal Research Center.
For primary bibliographic entry see Field 02J.
W73-09141

HOW TO GET THE SNOW WHERE YOU WANT IT TO GO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Schmidt, Jr.
Skiing Area News 6 (3): 20-21, 43-44, Summer 1971.

Descriptors: *Snow management, *Snow removal, *Skiing, *Slopes, Snowpacks, Snow cover, Structures, *Sublimation, Environmental engineering, Blizzards.
Identifiers: *Snowfences, *Blowing snow.

Through examples, the article shows how general principles of snow fence design and specific data may be applied to certain wind-caused snow control problems on ski areas.
W73-09380

PROCESSING SIZE, FREQUENCY, AND SPEED DATA FROM SNOW PARTICLE COUNTERS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Schmidt, Jr.

Descriptors: Snow, *Particle Size, *Data processing, Snowpacks, Snow management, *Sublimation, Suspended load, Electronic equipment, Instrumentation, *Blizzards, Frequency.
Identifiers: Particle counters, particle speed, Blowing snow.

This note describes techniques for electronically processing magnetic tape records from a photoelectric snow particle counter. Examples of the resulting particle size distributions, particle frequency plots, and measurements of particle speed are included.
W73-09381

GLACIATION NEAR LASSEN PEAK, NORTHERN CALIFORNIA,
Geological Survey, Denver, Colo.
D. R. Crandell.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C179-C188, 1972. 4 fig, 2 tab, 19 ref.

Descriptors: *Glaciation, *Pleistocene epoch, *California, *Weathering, *Stratigraphy, Glacial drift, Dating, Volcanoes, Glaciers, Sediments.
Identifiers: *Lassen Volcanic National Park.

Lassen Volcanic National Park in northern California was mostly covered by icecap glaciers during the Tahoe and Tioga Glaciations, and at least once during pre-Tahoe time. Glacial deposits of various ages are subdivided chiefly by weathering profiles in till, as shown by the relative amounts of clay formation, the presence and thickness of weathered rinds on volcanic stones at or near the ground surface, the depth of oxidation, and the color hues of the oxidized zone. During each glaciation the major ice-accumulation area in the western part of Lassen Volcanic National Park was on the slopes of the old Brokeoff Volcano, a Pleistocene volcano which covered an area of more than 100 square miles. Lassen Peak erupted during late Tioga time, about 11,000 years ago. In latest Tioga time, small glaciers formed on the flanks of Lassen Peak and on adjacent mountains at altitudes above 8,000 feet, whereas during the Tioga icecap glaciation the regional snowline near Lassen Peak was probably at about 7,000 feet. (Knapp-USGS)
W73-09450

EFFECT OF SEEPAGE STREAM ON ARTIFICIAL SOIL FREEZING,
University Engineers, Inc., Norman, Okla.
For primary bibliographic entry see Field 02G.
W73-09454

ICE-JAM INVESTIGATIONS AND COMPUTATIONS. PROBLEMS OF ICE ENGINEERING AND HYDRODYNAMICS (ISSLEDOVANIYA I RASCHETY ZATOROV I ZAZHOROV L'DA. VOPROSY LEDOTERMIKI I GIDRODINAMIKI).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-09461

SNOW CRYSTAL FORMS AND THEIR RELATIONSHIP TO SNOWSTORMS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
H. K. Weickmann.
In: Proceedings of the 29th Annual Eastern Snow Conference, February 3, 5, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 7-22, 1972. 15 fig, 13 ref.

Descriptors: *Cloud physics, *Snowfall, *Crystallography, *Precipitation (Atmospheric), Meteorology, Storm structure, Storms, Weather modification, Cloud seeding, *Great Lakes region, Snow.
Identifiers: *Snow crystallography.

Snow crystall forms are related to large-scale storm structure. In the Great Lakes basin, three basic snow precipitation systems can be clearly separated by the particles they discharge as well, and by the typical cloud system in which the particles originate. Planar double dendrites and spatial dendrites form through freezing of cloud droplets which are carried in the water-saturated updraft to their threshold temperatures; their size and the temperature at crystallization will determine whether a planar double dendrite or a spatial multibranch dendrite will form. The lower the termperature the more likely becomes the formation of a polycrystal for any droplet size. The great importance of irregular snow crystals for the efficient formation of precipitation follows from the fact that they offer a large surface area. (Knapp-USGS)
W73-09610

AUTOMATIC DATA ACQUISITION IN THE WESTERN UNITED STATES,
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.
M. Barton, and A. B. Holland.
In: Proceedings of the 29th Annual Eastern Snow Conference, February 3, 5, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 23-31, 1972. 3 fig, 1 tab.

Descriptors: *Telemetry, *Snowpacks, *Snow cover, *Data collections, *Hydrologic data, Snow surveys, Instrumentation, Automation, Data transmission, Precipitation gages.

The Soil Conservation Service has a remote telemetry data acquisition system in the western United States to obtain snow data and other hydrometeorological data from the remote and rugged western mountains on a daily or more frequent basis. The Soil Conservation Service has operational networks in eight western states acquiring data from 34 remote sites. Snow pressure pillows are fabricated from either neoprene rubber, sheet metal, or stainless steel as thin containers. A pillow, or a group of interconnected pillows, is usually installed flush with the ground sur-

face. The weight of the snow on the pillow configuration causes an increase in the internal pressure of the pillow fluid. This pressure is measured by means of a pressure transducer. Data are transmitted by radios via repeater links, as required, to a central base station. There the data are converted to digital form. The data can then be displayed or retransmitted by use of microwave or leased-line teletype circuits. Relative humidity and other hydrometeorologic parameters can be telemetered by using appropriate sensors such as precipitation, temperature, wind speed, and direction. (Knapp-USGS)
W73-09611

A RELATIONSHIP BETWEEN SNOW ACCUMULATION AND SNOW INTENSITY AS DETERMINED FROM VISIBILITY,
National Weather Service, Garden City, N.Y. Eastern Region.
S. E. Wasserman, and D. J. Monte.
In: Proceedings of the 29th Annual Eastern Snow Conference, February 3, 5, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 47-52, 1972. 4 tab, 2 ref.

Descriptors: *Precipitation intensity, *Snowfall, *Estimating, *Precipitation (Atmospheric), Data collections, Meteorological data, Weather data, New York.
Identifiers: Visibility, Snowfall rate, Snowfall intensity, *New York City (NY).

Hourly snow accumulation may be estimated from observations of snow intensity or visibility. The procedure was tested at La Guardia Field, New York City. The relationship between reported snow intensity and estimated snowfall was shown with independent data to be reliable. Results should aid in forecasting additional snow accumulation and in estimating previous snowfall when this information is not available from direct measurements. (Knapp-USGS)
W73-09612

APPROACHES TO MEASURING 'TRUE' SNOWFALL,
National Weather Service, Silver Spring, Md. Office of Hydrology.
L. W. Larson.
In: Proceedings of the 29th Annual Eastern Conference, February 3,4, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 65-76, 1972. 4 fig, 2 tab, 27 ref.

Descriptors: *Precipitation gages, *Snowfall, *Instrumentation, Data collections, Calibrations, *Wyoming, *Vermont, Gaging stations, Winds, Snow.

The catch of precipitation gages is affected by many variables. Wind has the strongest influence and an increase in wind speed will generally result in a decrease in catch. Proper cite protection can reduce the turbulence near the gage and will result in a more consistent and reliable measurement. Snowfall measured at a well-protected site is probably quite close to the actual point snowfall. The Wyoming project has as its major goal the investigation of shielding by the use of artificial wind barriers. Alter shields are used in conjunction with various fence combinations. The objective is to duplicate, as nearly as possible, the precipitation catch at a well-protected site in a forest opening with the catch of a gage located in an open windy area. The Vermont project has four sites. Two of these sites are suitable for use in evaluating the dual-gage approach. Well designed artificial wind barriers can be used to provide site protection for precipitation gages approximately equal to a well-protected natural site. The dual-gage approach and the profiling method for calculating ground true precipitation also have considerable merit. (Knapp-USGS)
W73-09613

ALBEDO OF SIMULATED SNOW SURFACES RELATED TO ROUGHNESS,
New Brunswick Univ., Fredericton. Faculty of Forestry.
R. B. B. Dickison.
In: Proceedings of the 29th Annual Eastern Snow Conference, February 3, 5, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 77-82, 1972. 4 fig, 2 tab, 3 ref.

Descriptors: *Albedo, *Snow cover, *Forests, Model studies, Snow, Snowpacks, Interception, *Canada, Snow surveys, Runoff forecasting, Snowmelt, Solar radiation.
Identifiers: *New Brunswick (Canada).

To investigate the effect of forest density on albedo in winter, a 12-foot square model forest was constructed of inverted conical paper cups and pipe cleaners. Artificial snow was sprayed onto the model to simulate intercepted snow on a forest canopy. Reflected solar radiation measurements were taken over the model as crown closure was reduced in a random block pattern from 100% to 10%. Albedo increased from about 0.66 to 0.88 as the density of the model forest decreased. (Knapp-USGS)
W73-09614

WIND EFFECTS ON SKI TRAILS,
New Hamshire Univ., Durham. Dept. of Mechanical Engineering.
R. J. A. Lof, R. W. Alperi, and C. K. Taft.
In: Proceedings of the 29th Annual Eastern Snow Conference, February 3, 5, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 83-97, 1972. 6 fig, 9 ref.

Descriptors: *Wind erosion, *Snowpacks, *Skiing, *Snow management, Model studies, Winds, Forests.
Identifiers: Ski trails, Snow fences.

Ski trails facing into the wind direction and those that are above tree line are particularly susceptible to being scoured of their snow cover. To find novel wind barrier techniques to reduce the scouring effect of the wind and induce snow deposition, an open channel model through which air is forced was designed. Tests on models simulating ski trails indicate that narrow, winding trails with short runs into the prevailing winds can greatly reduce wind erosion. A wind barrier in the form of a lifting body shape similar to a delta winged aircraft, properly oriented, was tested. This barrier has the ability to induce snow deposition into drifts of larger volume than conventional snow fences. Depending on the orientation and the number of barriers, one, two or three drifts are possible. Tests of larger scale models under actual wind conditions are being conducted. (Knapp-USGS)
W73-09615

THE MAPPING OF SNOWFALL AND SNOW COVER,
Atmospheric Environment Service, Ottawa (Ontario).
G. A. McKay.
In: Proceedings of the 29th Annual Eastern Snow Conference, February 3, 5, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 98-110, 1972. 2 fig, 43 ref.

Descriptors: *Mapping, *Maps, *Snowfall, *Snow cover, *Reviews, Data collections, Streamflow forecasting, Runoff forecasting, Climatology, Weather, Surveys.

Maps provide an excellent means of presenting and storing information on snowfall and snow cover. The history and status of snow mapping are reviewed. Most maps suffer from the deficiencies which have long been recognized to exist in snow data; this is, lack of precision and unrepresentativeness of measurements. Within recent years networks for the measurement of snow have been substantially enhanced. The accumulated data and new sources of information now make possible the preparation of maps of increased variety and detail. Until recently snowfall and snow-cover maps have had a more academic than practical value. Generally they were mean-value maps prepared on the basis of a skeletal network so as to obtain rough comparisons of snowiness and the duration of winter. Over the past 25 years more precise and detailed information has made possible a greater variety of maps. Snow maps are used or can be used in water resource planning, development, and operations; in the determination of snow loads; in the planning and development stages of tourism and recreation; in the planning of fertilizer sales; in land-use evaluation; in the allocation of funds for highway maintenance; and in evaluating the probabilities of survival and shaping conservation procedures for plants and wildlife. (Knapp-USGS)
W73-09616

LYSIMETER SNOWMELT AND STREAMFLOW ON FORESTED AND CLEARED SITES,
Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.
C. W. Martin, and J. W. Hornbeck.
In: Proceedings of the 29th Annual Eastern Snow Conference, February 3, 5, 1972, Oswego, New York: Eastern Snow Conference Publication, Vol 17, p 111-118, 1972. 6 fig, 1 tab, 8 ref.

Descriptors: *Snowmelt, *Lysimeters, *Runoff forecasting, *New Hampshire, Streamflow forecasting, Peak discharge, Melt water, Snow surveys, Snowpacks.
Identifiers: *Snowmelt lysimeters.

Snowmelt lysimeters were operated for two years on cleared and forested watersheds in central New Hampshire in an experiment to improve measurements for determining how specific variables affect snowmelt-streamflow relationships. The lysimeters readily detected advance in melt water contribution caused by forest clearing. On a daily basis, maximum melt water contribution at the soil surface occurred about one hour ahead of daily streamflow peaks. Peak melt water flow is moderated during passage through the soil. The continuous record of melt water at the base of the snowpack appears to be more useful and convenient for snowmelt studies than the interval measurement of snowpack changes obtained by the widely used snow-tube samplers. (Knapp-USGS)
W73-09617

2D. Evaporation and Transpiration

EVAPOTRANSPIRATION BY SUGAR CANE AS INFLUENCED BY METEOROLOGICAL FACTORS,
Hawaii Univ., Honolulu. Dept of Geography.
P. C. Prasad.
Ph D Thesis, December, 1971. 293 p, 38 fig, 46 tab, 173 ref.

Descriptors: *Evapotranspiration, *Lysimeters, *Hawaii, *Sugarcane, Solar radiation, Advection, Consumptive use, Irrigation effects.

Daily consumptive water use by springkler irrigated sugarcane was measured in four 100-ft square x 5-ft deep weighing lysimeters. About 4 months of the daily evapotranspiration were included in the analysis for the plant cane (age 127-254 days), a period when the consumptive water use for the crop increases to its maximum value. For the same incident radiation, a considerably higher pan evaporation occurred from August to December than did from January to July, a situation which reflected significant transport of advected energy. For the fullycanopied sprinkler-irrigated plant cane, the correlation coefficient

between evapotranspiration and the pan evaporation was 0.66, whereas for the entire ratoon cane it was 0.62. For the entire study period, which included many varied situations, 42.1% of the cane water use was explained by the pan evaporation. Incident radiation accounted for only 48.1% of the variations of water use for the sprinkler-irrigated plant cane with complete canopy, and 19.9% for the entire ratoon cane. The poor relationship was explained by the advection of energy from the surrounding fields. (Knapp-USGS)
W73-09137

AN ELECTRICAL ANALOGUE OF EVAPORATION FROM, AND FLOW OF WATER IN PLANTS,
Australian National Univ., Canberra. Dept. of Environmental Biology.
I. R. Cowan.
Planta (Berl). Vol 106, No 3, p 221-226. 1972.
Identifiers: *Plant physiology, Electrical analogue, *Evaporation, *Flow, Heat, Loss, Plants, Transport, Vapor.

The currents generated in the analogue circuit represent vapor loss from leaves, heat loss from leaves, and liquid flow in plant and soil. The plant and soil resistances are defined in such a way that they are consistent with the resistances to transport of vapor in the atmosphere and there is continuity of potential at the analogue liquid: air interface in the leaves. The action of the environment on plant water movement is treated as an application of Thevenin's theorem of electric circuits.--Copyright 1973, Biological Abstracts, Inc.
W73-09420

EVALUATION OF TURBULENT TRANSFER LAWS USED IN COMPUTING EVAPORATION RATES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
H. E. Jobson.
Open-file report, April 1973. 169 p, 33 fig, 26 ref.

Descriptors: *Evaporation, *Ponds, *Mathematical models, *Meterorological data, *Oklahoma, Analytical techniques, Equations, Correlation analysis, Mass transfer, Measurement, Estimating, Forecasting.
Identifiers: *Evaporation rates, Aerodynamic method.

The aerodynamic method of computing evaporation rates has a number of significant advantages over other methods. In order to use the aerodynamic method some functional form describing the variation of wind velocity with elevation must be assumed. Although the logarithmic law appears to be an adequate description when atmospheric conditions are neutrally stable, no wind law has been found which is satisfactory under all conditions of atmospheric stability. A combined logarithmic and linar law was designed to extend the applicability of the log law to conditions which are nearly neutrally stable. Data collected at Hefner, Oklahoma, were used to evaluate the theoretical correctness and practicality of the log-linear law for computing evaporation rates by the aerodynamic method. The theoretical correctness of the log-linear law was evaluated by comparing its results with those obtained by use of the logarithmic law. The mass-transfer method was used as a reference from which the practicality of the log-linear law can be judged. Provided that the measurement errors in the velocities are averaged out in a prescribed manner, the log-linear law can be expected to provide monthly evaporation rates which are accurate to within 17%. This accuracy approaches that which can be expected from the mass-transfer method. (Woodard-USGS)
W73-09434

ECOLOGY OF CORTICOLOUS LICHENS: III. A SIMULATION MODEL OF PRODUCTIVITY AS A FUNCTION OF LIGHT INTENSITY AND WATER AVAILABILITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-09512

A WATER BALANCE MODEL FOR RAIN-GROWN, LOWLAND RICE IN NORTHERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Darwin (Australia). Coastal Plains Research Station.
For primary bibliographic entry see Field 03F.
W73-09553

EFFECT OF AERIAL ENVIRONMENT AND SOIL WATER POTENTIAL ON THE TRANSPIRATION AND ENERGY STATUS OF WATER IN WHEAT PLANTS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 03F.
W73-09570

CLIMATE OF THE POTOMAC RIVER BASIN AND CLIMATOLOGICAL SUMMARIES FOR SPRUCE KNOB, WARDENSVILLE, ROMNEY AND MARTINSBURG, WEST VIRGINIA,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 02B.
W73-09602

EVAPOTRANSPIRATION OF EPIPHYTIC VEGETATION ON THE LOWER PART OF OAK (QUERCUS ROBUR) AND MAPLE-TREE (ACER CAMPESTRE) TRUNKS IN THE MIXED OAK FOREST AT VIRELLES-BLAIMONT (IN FRENCH),
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
G. Schnock.
Bull Soc R Bot Belg, Vol 105, No 1, p 143-150, 1972. Illus. English summary.
Identifiers: Acer-campestre-D, Belgium, Biomass, *Epiphytic vegetation, *Evapotranspiration, Forests, *Maple-D, *Oak-D, Quercus-robur-D, Rain, Transpiration, Tree trunks, Vegetation, Virelles-Blaimont.

In the mixed oak forest at Virelles-Blaimont (Belgium), the biomass of epiphytic layer overgrowing the bark at the lower part of the trunks (between 0 and 1 m) of O. robur and A. campestre amounts 355, 1 kg/ha in early year 1970. Its water saturation capacity, reached with an 8.0 mm rainfall during the leafy phenophase, is estimated at 0.133 mm. During this period, the water content of epiphytes (We) is linked with the atmospheric evaporating power (Ep ± Piche) by the following relation: We ± 0.1542 Ep-0.64. With the number, the size and the periodicity of showers, the water content of the epiphytic layer can be estimated using this relation, and the evapotranspiration may be calculated by subtraction between 2 successive showers. The calculations show that the mean evapotranspiration by shower is equal to 0.059 mm. Extrapolation to the whole leafy phenophase (mean of 3 periods: 1966, 1967 and 1968) suggests that the epiphytic vegetation of the lower part of the trunks may be assumed to evapotranspirate about 5.0 mm (0.92% of the total rainfall or 1.18% of the phytocenose evapotranspiration). This work shows that there is a slight overestimation of the infiltration water by omitting the evapotranspiration of the epiphytic vegetation overgrowing the trunks under run-off channels.--Copyright 1972, Biological Abstracts, Inc.
W73-09677

PERIODICAL FLUCTUATIONS OF THE MOISTURE CONTENT OF PRINCIPAL SPECIES COMPOSING THE HERBACEOUS LAYER AND MASS STRATA DURING 1969 (IN FRENCH),
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
For primary bibliographic entry see Field 02I.
W73-09679

2E. Streamflow and Runoff

EFFECTS OF RIVER CURVATURE ON A RESISTANCE TO FLOW AND SEDIMENT DISCHARGES OF ALLUVIAL STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
Y. Onishi, S. C. Jain, and J. F. Kennedy.
Available from the National Technical Information Service as PB-220 249, $3.00 in paper copy, $0.95 in microfiche. Iowa State Water Resources Research Institute Completion Report ISWRRI-46, December 1972. 150 p, 37 fig, 3 tab, 19 ref, append. OWRR A-029-IA (3) 14-01-0001-1634, 14-31-0001-3015 and 3215.

Descriptors: *Sediment transport, *Bed load, *Sediment discharge, *Channel morphology, *Meanders, Discharge (Water), Streamflow, Alluvial channels, Hydraulic models, Profiles, Sedimentology.
Identifiers: *Bend loss (Sediment transport).

The effects of channel meandering and of width of sinuous streams on the sediment loads and the friction factors of alluvial streams were investigated in laboratory flumes. Experiments were conducted in the subcritical flow domain in straight and meandering laboratory channels with sand beds and rigid walls. For given flow conditions, the sediment discharge per unit width in the full-width meandering channel was greater than sediment discharge in the straight flume, which in turn was greater than sediment discharge in the half-width meandering channel. The bend-loss coefficient, defined as the head loss due to channel curvature, normalized by the mean-velocity head, increases with Froude number, the ratio of bed hydraulic radius to median sand diameter, and the ratio of width to centerline radius of curvature. The bed forms, especially the point bars along the inner banks, play a dominant role in regulating the quasi-steady characteristics of meandering alluvial streams. (Knapp-USGS)
W73-09102

WATER RESOURCES OBSERVATORY STREAMFLOW DATA WATER YEAR 1972,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W73-09109

A BAYESIAN APPROACH TO AUTOCORRELATION ESTIMATION IN HYDROLOGIC AUTOREGRESSIVE MODELS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 02A.
W73-09120

HYDROLOGIC INVESTIGATIONS OF PRAIRIE POTHOLES IN NORTH DAKOTA, 1959-68,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02H.
W73-09130

A HYDROLOGICAL MODEL FOR ESTIMATING THE INFLOWS TO AND OUTFLOWS FROM GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-09139

OXYGEN DISTRIBUTION IN THE PACIFIC OCEAN,
Bedford Inst., Dartmouth (Nova Scotia).
I. W. Duedall, and A. R. Coote.
Journal of Geophysical Research, Vol 77, No 12, p 2201-2203, April 20, 1972. 2 fig, 9 ref.

Descriptors: *Oxygen, *Pacific Ocean, Stratification, Ocean currents, Climatic zones, Hawaii, Distribution patterns.
Identifiers: Antarctic water, Pacific intermediate water, South Pacific deep water.

A Pacific Ocean oxygen section based on data collected during the Hudson 70 expedition is presented. The section is on the 150 deg W meridian and extends from 63 deg S to 55 deg N. The oxygen features described are consistent with features reported by Reid (1965). Also shown in the section is evidence for the recently reported bottom current that flows east around Hawaii (Edmond, Chung, and Sciater, 1971). The cruise track and stations occupied are shown on a map. Oxygen values for different depths are presented on a section along the cruise track. (Lang-USGS)
W73-09147

WAVE SET-UP ON CORAL REEFS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
R. J. Tait.
Journal of Geophysical Research, Vol 77, No 12, p 2207-2211, April 20, 1972. 2 fig, 1 tab, 16 ref.

Descriptors: *Waves (Water), *Reefs, *Coral, *Sediment distribution, Ocean circulation, Atolls, Channels, Lagoons, Beaches, Tidal energy.
Identifiers: Sea-level reefs.

References are presented of theoretical studies and observations of varying conditions by several investigators of wave effects on reef environments. Properties of an idealized reef are described. Momentum flux considerations give fairly good predictions on the amount of wave-induced setup to be expected on coral reefs. Water levels on the outer edge of sea-level reefs may be raised as much as 20% of the incident wave height above mean water level just seaward of the reef. Such wave setup can significantly affect circulation and sediment behavior in the coral reef environment. (Lang-USGS)
W73-09148

SAND RIDGES AND WAVES ON THE SHELF OF TIDAL SEAS,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
P. S. Chakhotin, V. S. Medvedev, and V. V. Longinov.
Oceanology, Vol 12, No 3, p 386-394, 1972. 3 fig, 1 tab, 9 ref. Translated from Okeanologiya (USSR), Vol 12, No 3, p 457-469, 1972.

Descriptors: *Oceanography, *Continental shelf, *Dunes, *Sand waves, *Tidal waters, Tidal streams, Tides, Currents (Water), Movement, Sediments, Dimensions, Velocity, Profiles, Regions, Sounding.
Identifiers: *USSR, *Sand ridges.

Investigations of sand ridges and their associated sand waves on the shelf of tidal seas are based on data published in foreign literature. Descriptions of these aggradational forms indicate that they are produced by strong tidal currents when there is a sufficient supply of sand on the shelf. The spatial arrangement of the ridges corresponds to the direction of the tidal currents in a given area, and the ratio of the distance between ridges to their height varies between 200 and 650. Data are presented on the structure and composition of ridges and of the bottom waters above them, and various hypotheses are advanced to explain the mechanism of ridge formation and ridge dynamics. (Josefson-USGS)
W73-09153

EXPERIMENTAL STUDY OF HORIZONTAL TURBULENCE IN THE LITTORAL ZONE USING OCEAN CURRENT DATA FROM AN AERIAL SURVEY,
State Oceanographic Inst., Moscow (USSR).
I. Z. Konovalova.
Oceanology, Vol 12, No 3, p 443-450, 1972. 5 fig, 3 tab, 15 ref. Translated from Okeanologiya (USSR), Vol 12, No 3, p 527-534, 1972.

Descriptors: *Oceanography, *Ocean currents, *Littoral, *Turbulence, *Aerial photography, Surveys, Floats, Velocity, Distance, Fluctuations, Variability, Curves.
Identifiers: *USSR, *Black Sea, Turbulent diffusion.

Computation of horizontal turbulent diffusion coefficients and determination of some statistical turbulence parameters from current velocity fluctuations were based on aerial photographic surveys of floats off the Caucasian coast of the Black Sea in the summers of 1961-62. Variability of the horizontal diffusion coefficients obtained was analyzed as a function of the scale of the phenomenon and the distance from the coast. Turbulence characteristics obtained from aerial photo survey data are reliable and can be used in general estimates of horizontal exchange in a coastal zone and in various practical computations. (Josefson-USGS)
W73-09154

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3, OHIO RIVER BASIN--VOLUME 2, OHIO RIVER BASIN FROM KANAWHA RIVER TO LOUISVILLE, KENTUCKY.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09160

SUSPENDED SEDIMENT DISCHARGE IN WESTERN WATERSHEDS OF ISRAEL,
Hebrew Univ., Jerusalem (Israel). Dept of Geography.
For primary bibliographic entry see Field 02J.
W73-09163

SOME MECHANISMS OF OCEANIC MIXING REVEALED IN AERIAL PHOTOGRAPHS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 07B.
W73-09168

PRECISION REQUIREMENTS FOR A SPACECRAFT TIDE PROGRAM,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 07B.
W73-09170

ABUNDANCE AND HARVEST OF TROUT IN SAGEHEN CREEK, CALIFORNIA,
California Univ., Berkeley. School of Forestry and Conservation.
R. Gard, and D. W. Seegrist.
Trans Am Fish Soc. Vol 101, No 3, p 463-477. 1972. Illus.

Identifiers: *California, Fish management, Sagehen, Creek (Calif), Salmo-Gairdneri, Salmo-Trutta, Salvelinus-Fontinalis, *Trout, *Fish harvest.

Between 1952 and 1961 standing crops of brook (Salvelinus fontinalis), rainbow (Salmo gairdneri), and brown (Salmo trutta) trout were determined in Aug. for a 5.7 mile section of Sagehen Creek in east-central California. In 1953 a creel census was initiated which continued through 1961. The purpose of the study was to determine if a moderately productive wild trout stream could support a substantial angler harvest over an extended period without augmentation with hatchery-reared trout. The 10-yr average standing crop of all trout was 1578 (37 lb)/acre. Standing crops declined somewhat during the study period, largely due to habitat deterioration rather than to fishing. Floods and abandonment of beaver impoundments were the primary adverse influences on trout habitat. Catch did not decline significantly over the period. Fishermen annually removed 23-47% (average, 33%) of all trout over 99 mm in length, but recruitment replaced the loss. Although the natural fishery has proven to be viable, the trout population is not characterized by many large fish. Recommended is an experimental management program aimed at restoring some of the brown trout habitat by construction of low dams similar to the beaver dams that formerly were so productive, and increasing the number of larger trout in the stream by regulation of the take. If each large trout is subject to multiple capture and release, additional high-quality sport would be provided. Future studies could evaluate the effect on the fishery of these changes in management.--Copyright 1973, Biological Abstracts, Inc.
W73-09179

FLEXIBLE ROUGHNESS IN OPEN CHANNELS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-09271

RAINFALL EFFECT ON SHEET FLOW OVER SMOOTH SURFACE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and R.-M. Li.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 99, No HY5, Paper 9733, p 771-792, May 1973. 7 fig, 2 tab, 9 ref, append. OWRR Grant 14-01-0001-1435.

Descriptors: *Sheet flow, *Fluid friction, *Impact (Rainfall), *Statistical methods, *Shear stress, Mathematical models, Boundary layers, Numerical analysis, Overland flow, Hydraulics, Turbulence, Rainfall intensity.

The variation of friction factor for sheet flow influenced by various flow and rainfall conditions was established by statistical analysis. Boundary shear stress was also directly measured by hot-film anemometry. The friction factor is a function of both the flow Reynolds number and the rainfall intensity for a flow Reynolds number of less than 900. For a flow Reynolds number greater than 2,000, the friction factor is a function only of Reynolds number. A numerical model and a simplified procedure to predict the water surface profiles and boundary shear stresses for sheet flow with rainfall are presented. The computations of flow depths and boundary shear stresses are not too sensitive to the effect of uncertainties in selecting friction factor. (Knapp-USGS)
W73-09273

FLOODS IN MAPLE PARK QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09298

FLOODS IN RILEY QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09299

LINEAR STABILITY OF PLAIN POISEUILLE FLOW OF VISCOELASTIC LIQUIDS,
Delaware Univ., Newark. Dept. of Chemical Engineering.
K. C. Porteus, and M. M. Denn.
Transactions of the Society of Rheology, Vol 16, No 2, p 295-308, 91972. 9 fig, 17 ref.

Descriptors: *Rheology, *Critical flow, *Laminar flow, *Turbulent flow, Reynolds number, Viscosity.
Identifiers: Viscoelastic fluids.

The stability of plane Poiseuille flow to infinitesmal perturbations was studied for the second order and Maxwell fluid rheological models. When the disturbance propagation (based on the Deborah number) is small, the second order fluid is described by a consistent constitutive equation, and the two models give identical results. This occurs for elasticity number less than 0.0005. At higher values, the second order fluid model cannot be used. The critical Reynolds number is a slowly decreasing function of elasticity up to 0.0001 and a rapidly decreasing function subsequently, in the region where fluid relaxation effects become important. For a sufficiently elastic fluid the flow transition is described by a new mode of the Orr-Sommerfeld equation and differs qualitatively from that for a Newtonian liquid. Instability is likely at low Reynolds numbers in highly elastic liquids. (Knapp-USGS)
W73-09431

WATER-RESOURCE EFFECTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-09432

INVESTIGATIONS OF MORPHOLOGY AND HYDRAULICS OF RIVER CHANNELS, FLOOD PLAINS, AND BODIES OF WATER FOR STRUCTURAL DESIGN (ISSLEDOVANIYA MORFOLOGII I GIDRAVLIKI RECHNYKH RUSEL, POYM I VODOYEMOV DLYA NUZHD STROITEL' NOGO PROYEKTIROVANIYA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-09460

HYDROMORPHOLOGICAL INVESTIGATIONS OF FLOOD-PLAIN AND CHANNEL PROCESSES (GIDROMORFOLOGICHESKIYE ISSLEDOVANIYA POYMENNOGO I RUSLOVOGO PROTSESSOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-09462

THE CHEMICAL TYPE OF WATER IN FLORIDA STREAMS,
Geological Survey, Tallahasse, Fla.
For primary bibliographic entry see Field 07C.
W73-09594

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. S. Bader, and F. Kunkel.
Open-file report, 1969. 95 p.

Descriptors: *Bibliographies, *Publications, *Water resources, *California, Documentation, Reviews, Indexing, Information retrieval, Computer programs.

This bibliography lists alphabetically by author all water-resources reports prepared by the U.S. Geological Survey for public agencies in California through September 1969. It also lists selected nationwide reports that contain information pertinent to California. In addition, general hydrologic and research reports by personnel of the California district office of the Pacific Coast regional office at Menlo Park, Calif., are included, although those reports make no specific reference to California. The bibliographic list is indexed according to hydrologic area, county, and subject. A report may be indexed under one or more hydrologic areas, counties, and (or) subjects. The indexes list only the first line of the bibliographic citation; for the complete citation, refer to the bibliographic list. The computer program for which this compilation was prepared can be expanded to include additional subject categories and states. (Woodard-USGS)
W73-09603

FLOODFLOW CHARACTERISTICS OF EAST FORK HORSEHEAD CREEK AT INTERSTATE HIGHWAY 40, NEAR HARTMAN, ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 04C.
W73-09608

LYSIMETER SNOWMELT AND STREAMFLOW ON FORESTED AND CLEARED SITES,
Forest Service (USDA), Durham, N.H. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 02C.
W73-09617

FLOODS IN THE RIO GUANAJIBO VALLEY, SOUTHWESTERN PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09618

2F. Groundwater

THE TRANSIENT BEHAVIOR OF RECHARGE--DISCHARGE AREAS IN REGIONAL GROUNDWATER SYSTEMS,
Maryland Univ., College Park. Dept. of Civil Engineering.
M-T. Tseng, R. M. Ragan, and Y. M. Sternberg.
Maryland Water Resources Research Center, Technical Report No 12, December 1972. 102 p, 15 fig, 3 tab, 47 ref, 6 append. OWRR A-017-MD (1) 14-31-0001-3220.

Descriptors: *Mathematical models, *Groundwater movement, *Recharge, *Unsteady flow, Numerical analysis, Hydraulic models, Laplaces equation, Artificial recharge, Drawdown, Water table, Water yield, Computer programs.

Mathematical models were developed for theoretical analysis of tnsteady fluid motion in an unconfined homogeneous, isotropic aquifer subject to local recharge. The models apply to one- and two-dimensional analysis of the flow problems within the saturated zone. In the one-dimensional analysis, the system of partial differential equations is quasi-linear and of the hyperbolic type. In the two-dimensional analysis, the problem reduces to the solution of the Laplace equation satisfying the boundary conditions, including that of the complete nonlinear free surface. Numerical solutions were obtained for the outflow hydrograph and the temporal variation of the free surface for the one-dimensional case. For the two-dimensional analysis, the temporal and spatial variations for of flow patterns were also attained. These numerical results were compared with the experimental data from a Hele-Shaw model. Good agreement was obtained, but the calculated one-dimensional results fail to reproduce the variation of the free surface configurations under transient flow conditions. (Knapp-USGS)
W73-09105

PROCEEDINGS OF CONFERENCE ON TOWARD A STATEWIDE GROUNDWATER QUALITY SUBCOMMITTEE CITIZENS ADVISORY COMMITTEE, GOVERNORS ENVIRONMENTAL QUALITY COUNCIL.
For primary bibliographic entry see Field 05B.
W73-09113

GROUND-WATER LEVELS IN THE LOWER ARKANSAS RIVER VALLEY OF COLORADO, 1969-73,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-09123

APPRAISAL OF GROUNDWATER FOR IRRIGATION IN THE LITTLE FALLS AREA, MORRISON COUNTY, MINNESOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-09126

GROUNDWATER RESOURCES OF THE NORCO AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-09128

RESPONSE OF KARST AQUIFERS TO RECHARGE,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
W. G. Knisel.
Colorado State University Hydrology Paper No 60, December, 1972. 48 p, 55 fig, 7 tab, 35 ref.

Descriptors: *Groundwater recharge, *Karst, *Aquifers, *Springs, *Aquifer characteristics, Rainfall, Groundwater movement, Discharge (Water), Data collections, Correlation analysis, Time series analysis, Systems analysis, Methodology, Evaluation, Texas, Missouri.

Three springflow measuring stations were studied where groundwater discharges from karstified limestone. The measured flow consisted only of groundwater outflow. Two springs were located in the Edwards Plateau of Texas and the third in south-central Missouri. Daily rainfall and mean daily springflow data were analyzed to determine the structure of the time series. Harmonic analysis was made to determine significant periodicity for 1-, 3-, 7-, and 14-day mean rainfall and springflow. Stochastic models of rain fall and springflow were developed for 1-day values of each time series. Recharge of karst aquifers was estimated from rainfall by fitting a serpentine curve based on physical relations. Systems analysis was applied to determine system identification for springflow simulation. Convolution transfer functions were estimated by four methods: (1) optimization by the Wiener-Hopf equation, (2) optimization by multiple regression techniques, (3) harmonic series for total springflow, and (4) two-parameter gamma function. The two-parameter gamma function with estimated recharge provided the best results of simulation as determined by the computed chi-square. The harmonic function was the least accurate of the simulation procedures. (Woodard-USGS)
W73-09129

SUBSURFACE DRAINAGE SOLUTIONS BY GALKERIN'S METHODS,
Colorado State Univ., Fort Collins. Dept of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-09132

SAFE YIELD IN WEST MAUI BASAL AQUIFERS,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 04B.
W73-09135

ARTIFICIAL RECHARGE IN THE WATERMAN CANYON-EAST TWIN CREEK AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W73-09140

AQUIFER TEST, SOLDOTNA, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 04B.
W73-09143

DYNAMICS OF FLUIDS IN POROUS MEDIA,
Technion - Israel Inst. of Tech., Haifa.
J. Bear.
American Elsevier Co., Inc., New York, N.Y., 1972. 764 p.

Descriptors: *Hydraulics, Flow around objects, Flow nets, Flow resistance, *Dynamics, *Pourous media, Saline water-freshwater interfaces, Aquifers, Boundaries (Surfaces), Mathematical studies, Analog models, Analysis, Hydrology.
Identifiers: Statics, Polyphase flow, *Groundwater hydrology.

The theory of dynamics (and of statics) of fluids in porous media is presented, as applicable to many disciplines of science and engineering. First principles of fluid mechanics and mechanics of continua are given initially, followed by an illustration of the passage from the microscopic to the macroscopic level of treatment. Special features of porous media are emphasized, and the macroscopic theory is established. Special cases of practical interest are presented. Emphasis is placed upon understanding the microscopic phenomena occurring in porous media and on their macroscopic description. The reader is led to grasp the meanings of the various parameters and coefficients appearing in the macroscopic descriptions of problems of flow through porous media, and their actual determination, as well as the limitations and approximations inherent in their description. In each case, the objective is to achieve a clear formulation of the flow problem considered and a complete mathematical statement of it in terms of partial differential equations and a set of initial and boundary conditions. (Smith-NWWA)
W73-09257

GROUNDWATER HYDRAULICS OF EXTENSIVE AQUIFERS,
For primary bibliographic entry see Field 04B.
W73-09263

GROUND-WATER LEVELS IN THE SOUTH PLATTE RIVER VALLEY OF COLORADO, SPRING 1973,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-09280

HYDROLOGY OF THE MARTINSBURG FORMATION IN LEHIGH AND NORTHAMPTON COUNTIES, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
C. W. Poth.
Pennsylvania Geological Survey, 4th Series, Bulletin W 30, 1972. 52 p, 5 fig, 1 plate, 7 tab, 15 ref.

Descriptors: *Groundwater resources, *Aquifers, *Well data, *Water quality, Pennsylvania, Pumping, Water yield, Drawdown, Specific capacity, Groundwater recharge, Groundwater movement, Chemical analysis, Water analysis, Water utilization, Aquifer characteristics, Hydrogeology, Hydrologic data.
Identifiers: *Lehigh County (Penn), *Northampton County (Penn).

The Martinsburg Formation underlies the northern half of Lehigh and Northampton Counties, and is of Middle and Late Ordovician age. It is bounded on the south by older Ordovician limestone formations and on the north by a ridge-forming conglomerate of Silurian age. Recent mapping has supported a three-part division of the Martinsburg into a lower thin-bedded slate (Bushkill Member), a middle graywacke-bearing unit (Ramseyburg Member), and an upper thick-bedded slate (Pen Argyl Member). Data were collected on 332 wells in Lehigh County and 402 wells in Northampton County. Fifty-four wells were test pumped for 1 hour. The depths of the nondomestic wells average about twice those of the domestic wells (240 feet versus 125 feet in Lehigh County and 225 feet versus 112 feet in Northampton County). Also, the nondomestic wells yield about three to five times as much water as the domestic wells: 36 gpm versus 13 gpm in Lehigh County and 75 gpm versus 15 gpm in Northampton County. The specific capacities were greatest in the Pen Argyl Member and least in the Bushkill Member. The formation as a whole had a specific capacity of about 0.5 gpm per foot drawdown. Chemical analyses show that the groundwater has a median dissolved-solids content of 166 mg/liter. The principal dissolved constituents are calcium, magnesium, bicarbonate, and sulfate ions. (Woodard-USGS)
W73-09286

GEOHYDROLOGY OF THE NEEDLES AREA, ARIZONA, CALIFORNIA, AND NEVADA,
Geological Survey, Washington, D.C.
D. G. Metzger, and O. J. Loeltz.
For sale by Sup Doc, GPO, Washington, D.C. 20402 Price $1.75. Geological Survey Professional Paper 486-J, 1973. 54 p. 25 fig, 3 plate, 11 tab, 31 ref.

Descriptors: *Groundwater resources, *Water quality, *Hydrogeology, *Colorado River, Interstate, Arizona, California, Nevada, Water wells, Aquifer chracteristics, Pumping, Water yield, Drawdown, Specific capacity, Groundwater movement, Groundwater recharge, Irrigation, Water level fluctuations, Precipitation (Atmospheric), Hydrologic data.
Identifiers: *Needles Area (Colorado River).

The Needles area, which includes Mohave and Chemehuevi Valleys, extends from Davis Dam (57 miles south of Hoover Dam) southward to Parker Dam. It is in Mohave County, Ariz., San Bernardino County, Calif., and Clark County, Nev. Wells in the area that tap a sufficient thickness of Colorado River gravels have specific capacities as high as 400 gallons per minute per foot of drawdown. Groundwater in the Colorado River alluviums occurs under water-table conditions. Groundwater may occur under artesian conditions in or below the Bouse Formation. Sources of recharge to the groundwater reservoir are the Colorado River, unused irrigation water, runoff from precipitation, and underflow from bordering areas. Of these, the Colorado River is by far the principal source. Groundwater in the Needles area is of better quality than that in other parts of the lower Colorado River. Of the 95 samples analyzed, 46 had dissolved solids of less than 1,000 mg/liter and six had less than 500; the smallest concentration was 314 mg/liter. On the other extreme, six analyses had dissolved-solids content of more than 2,000 mg/liter; the largest concentration was 3,290 mg/liter. (Woodard-USGS)
W73-09287

CHANGE IN POTENTIOMETRIC HEAD IN THE LLOYD AQUIFER, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 04B.
W73-09293

CONCEPTS OF KARST DEVELOPMENT IN RELATION TO INTERPRETATION OF SURFACE RUNOFF,
Geological Survey, Raleigh, N.C.
H. E. LeGrand, and V. T. Stringfield.
Journal of Research of the U S Geological Survey, Vol 1, No 3, p 351-360, May-June 1973. 8 fig, 32 ref.

Descriptors: *Karst hydrology, *Surface-groundwater relationships, *Streamflow, Caves, Subsurface drainage, Springs, Sinks, Topography, Geomorphology, Hydrogeology, Carbonate rocks.

In regions underlain by carbonate rocks the streamflow characteristics are related to processes of karstification, which is dependent on circulation of subsurface water and solution of the rock. Cavernous and permeable unsaturated zones tend to keep the water table depressed below land surface in many karst regions, a condition that leads to a low density of perennial streams. The uneven distribution of permeability beneath surface karst streams causes them to lose or gain water, depending on the position of the water table with reference to stream level. The conventional techniques of interpolation and extrapolation that have been reasonably successful in approximating streamflow of ungaged sites in nonkarstic regions have only limited use in karst regions. An understanding of principles of karstification and an understanding of the hydrogeologic framework of a carbonate terrane provide a useful basis for evaluating the streamflow characteristics. (Knapp-USGS)
W73-09294

EVALUATING THE RELIABILITY OF SPECIFIC-YIELD DETERMINATIONS,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 04B.
W73-09297

WATER-RESOURCE EFFECTS,
Geological Survey, Washington, D.C.
A. O. Waananen, and W. R. Moyle, Jr.
Available from Sup Doc, GPO, Washington, D.C. 20402, Price $6.25. In: The Borrego Mountain Earthquake of April 9, 1968: Geological Survey Professional Paper 787, p 183-189, 1972. 4 fig, 2 tab, 6 ref.

Descriptors: *Earthquakes, *California, *Water level fluctuations, Groundwater, Surface waters, Seiches, Turbidity, Water quality.
Identifiers: *Borrego Mountain earthquake (Calif).

The principal effect of the Borrego Mountain, (Calif.), earthquake of 1968 on water resources was seismic in nature and almost entirely transient, as shown by the charts from recorders on groundwater observations wells in California, Arizona, and Nevada, and at gaging stations in California. Hydroseisms were recorded at several sites nearly 500 km from the epicenter. At most sites, the effects were limited to water-level or water-surface fluctuations, with some minor and insignificant net changes in water level at many wells; changes in streamflow were observed at only two sites. Hydroseisms were observed also in many swimming pools near the epicenter, in San Diego County, and near Los Angeles. The effects

on water quality were minor, and no significant problems were reported. (Knapp-USGS)
W73-09432

REGIONAL RATES OF GROUND-WATER MOVEMENT ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
O. L. Franke, and P. Cohen.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C271-C277, 1972. 5 fig, 1 tab, 14 ref.

Descriptors: *Groundwater movement, *New York, *Analog models, Saline water intrusion, Water balance, Path of pollutants, Septic tanks, Sewers, Water pollution control, Urban hydrology.
Identifiers: *Long Island (N Y).

Regional rates of groundwater movement on Long Island, N.Y., computed with the aid of a steady-state electrical analog model, indicate that near the boundary between Nassau and Suffolk Counties the length of time required for groundwater recharge to move seaward of the barrier beaches is about 800 years for water entering the Magothy aquifer and 3,000 years for water entering the Lloyd aquifer. These computations are based upon an assumed rate of natural recharge of 21 inches per year and upon the configuration of the natural groundwater flow net associated with that rate of recharge. About 25-30 years is the maximum time required for water to drain from one of the shallow groundwater subsystems into East Meadow Brook. If the dissolved substances are assumed to move at the same rate as the water, then these lengths of time indicate the orders of magnitude of the times required for groundwater containing substances of sewage origin (largely derived from cesspools and septic tanks) to be flushed from the groundwater system after completion of planned wide-scale sanitary sewering systems in Nassau and Suffolk Counties. (Knapp-USGS)
W73-09441

DISTORTION OF THE GEOTHERMAL FIELD IN AQUIFERS BY PUMPING,
Geological Survey, Washington, D.C.
R. Schneider.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C267-C270, 1972. 3 fig, 10 ref.

Descriptors: *Geothermal studies, *Water temperature, *Hydrogeology, *Withdrawal, Drawdown, Aquifers, Aquifer characteristics, Heat flow, Sand aquifers, Karst, Artesian aquifers.

The extent and nature of distortion of geothermal fields in aquifers by pumping were assessed by comparing observed geothermal profiles with reconstructed natural profiles for three areas of contrasting geohydrologic conditions in three Tertiary aquifers. In the Sparta Sand at Fordyce, Ark., a negative departure of about 0.8 deg C, results from induced downward flow of cool water. A positive departure of about 1.9 deg C in a shallow zone of the heavily pumped artesian carbonate-rock aquifer in Brunswick, Ga., near the center of an extensive potentiometric depression, results from horizontal flow of warm water derived in part from a distant region where water moves upward. A more complex condition was found in the intensively developed '500-foot' sand (Claiborne Group) in Memphis, Tenn. A positive departure of about 0.8 deg C near the lower part of the screened interval of a municipal well and a negative departure of about 0.4 deg C near the upper part suggest simultaneous movement of warm water from below and cool water from above. In the confining beds above the artesian aquifer downward infiltration of warm water from a shallow water-table aquifer is suggested by the positive 1.2 deg C departure. (Knapp-USGS)
W73-09442

GEOLOGY AND GROUND-WATER RESOURCES OF PRATT COUNTY, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 04B.
W73-09453

SUBSURFACE WASTEWATER INJECTION, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05E.
W73-09456

FLUORIDE CONCENTRATIONS IN WATERS OF THE MOLDAVIAN ARTESIAN BASIN (K VOPROSU OB USLOVIYAKH FORMIROVANIYA FTORSODERZHASHCHIKH VOD MOLDAVSKOGO ARTEZIANSKOGO BASSEYNA),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 02K.
W73-09457

GROUNDWATER OF THE KURA-ARAKS LOWLAND (GRUNTOVYYE VODY KURA--ARAKSINSKOY NIZMENNOSTI),
G. Yu. Israfilov.
Izdatel'stvo 'Maarif', Baku, 1972. 208 p.

Descriptors: *Groundwater, *Hydrogeology, Geomorphology, Stratigraphy, Petrology, Aquifers, Surface-groundwater relationships, Groundwater recharge, Infiltration, Water sources, Water table, Water levels, Water level fluctuations, Water chemistry, Water types, Confined water, Water temperature, Geologic time, Profiles, Maps.
Identifiers: *USSR, *Azerbaydzhan, *Kura-Araks lowland.

The physiography and geological structure of the Kura-Araks lowland in eastern Azerbaydzhan are described with particular emphasis given to changes in the hydrogeological conditions of goundwater aquifers in the last 35-40 years. Hydrogeological maps show the depth of occurrence and chemistry of groundwater and the delineation of the lowland according to groundwater types. (Josefson-USGS)
W73-09458

DETERMINATION OF THE AGE OF GROUNDWATER IN THE FERGANA ARTESIAN BASIN (OB OPREDELENII VOZRASTA PODZEMNYKH VOD FERGANSKOGO ARTEZIANSKOGO BASSEYNA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
A. N. Sultankhodzhayev, G. Yu. Azizov, and S. U. Latipov.
Uzbekskiy Geologicheskiy Zhurnal, No 2, p 72-75, 1971. 1 tab, 4 ref.

Descriptors: *Groundwater, *Groundwater basins, *Artesian wells, *Radioactive dating, *Age, Geologic time, Stratigraphy, Rocks, Gases, Potassium, Deuterium, Confined water, Radioactive well logging, Estimating, Equations.
Identifiers: *USSR, *Fergana, Uranium, Thorium, Radium.

To estimate the age of groundwater in the Fergana artesian basin, the helium-argon method was used. Rock samples of different composition and age were analyzed to determine the average content of uranium, thorium, and radium in the rocks. The age of groundwater in Upper Neogene deposits of the basin varies between 0.56 and 6.0 million years, and the age of groundwater in Lower Neogene deposits ranges from 3.5-5 million years in the central part of the basin to 7.37-9.8 million years in the low foothills bordering the depression. (Josefson-USGS)
W73-09466

GROUND-WATER RESOURCES OF BRAZORIA COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-09590

GROUND-WATER RESOURCES OF DONLEY COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-09591

COMPUTER MODEL FOR DETERMINING BANK STORAGE AT HUNGRY HORSE RESERVOIR, NORTHWESTERN MONTANA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04A.
W73-09600

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE STERLING REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-09605

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE BRUSH REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-09606

2G. Water in Soils

HYDROLOGIC SIMULATION OF DEPRESSIONAL WATERSHEDS,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 02A.
W73-09101

USE OF NATURALLY IMPAIRED WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 03C.
W73-09116

SUBSURFACE DRAINAGE SOLUTIONS BY GALKERIN'S METHODS,
Colorado State Univ., Fort Collins. Dept of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-09132

THE EFFECT OF SURFACE TREATMENTS ON SOIL WATER STORAGE AND YIELD OF WHEAT,
South Australian Dept. of Agriculture, Adelaide.
For primary bibliographic entry see Field 03F.
W73-09241

WEATHERING OF MICACEOUS CLAYS IN SOME NORWEGIAN PODZOLS,
Norges Landbrukshoegskole, Vollebekk. Inst. of Soil Science.

B. S. Kapoor.
Clay Minerals, Vol 9, No 4, p 383-394, December 1972. 3 fig, 2 tab, 29 ref.

Descriptors: *Weathering, *Clay minerals, *Podzols, Soil formation, Clays, Illite, Mineralogy, Montmorillonite.
Identifiers: *Norway.

Weathering of micaceous clays in some Norwegian podzols results in a decrease in the amounts of illite and chlorite, and an increase in vermiculite and mixed-layer minerals upward in the profile. Illite, the dominant mineral at depth, weathers to hydrobiotite in the surface horizon of the profile. Subsequent weathering of hydrobiotite in this portion of the profile produces trioctahedral vermiculite and smectite, or intergrade smectite-chlorite. (Knapp-USGS)
W73-09275

YIELD OF SOYBEANS AND OIL QUALITY IN RELATION TO SOIL TEMPERATURE AND MOISTURE IN A FIELD ENVIRONMENT,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 03F.
W73-09307

A PREDICTION TECHNIQUE FOR SNAP BEAN MATURITY INCORPORATING SOIL MOISTURE WITH THE HEAT UNIT SYSTEM,
National Weather Service, Clemson, S.C.
For primary bibliographic entry see Field 03F.
W73-09336

SOIL WATER DISTRIBUTION ON A CONTOUR-TRENCHED AREA,
Forest Service (USDA), Logan, Utah. Intermountain Forest and Range Experiment Station.
R. D. Doty.
USDA Forest Service Res. Note INT-163, 6 p, Illus, 1972.

Descriptors: *Soil moisture, *Contour furrows, *Alteration of flow, *Flood control, Utah, Land management, Contours, Small watersheds, Watershed management, Contour trenches (Soil water).

Six years of soil water measurements on and adjacent to a contour-trenched area revealed that some redistribution of soil water occurred following trenching. However, trenching did not alter the soil water conditions sufficiently to significantly change water yields from the catchment. A reduction in water use from trench bottoms was offset by an increased loss from the cut bank and trench fills. No change in soil water was apparent between trenches.
W73-09375

GROWTH AND HYDROLOGIC INFLUENCE OF EUROPEAN LARCH AND RED PINE 10 YEARS AFTER PLANTING,
Forest Service, (USDA), La Crosse, Wis. Watershed Lab.
For primary bibliographic entry see Field 04C.
W73-09377

STUDY FOR DETERMINATION OF SOIL DRAINAGE CLASSES IN THE SOIL SURVEY (IN KOREAN),
Institute of Plant Environment, Suwon (Korea).
K. T. Um.
Res Rep Off Rural Dev (Plant Environ) (Suwon). 14, p 45-51. 1971. English summary.
Identifiers: *Soil classification, Soil color, *Drainage, Mottling, Soils, Survey, Topography.

Determination of soil drainage classes are given for the soils in the 125 soil series. Soil drainage classes are divided into 5 groups: somewhat excessively drained, well drained, moderately well drained, imperfectly or somewhat poorly drained, and poorly drained. These are based on topography, soil color, water table and the presence, depth and abundance of mottles. There is usually a relationship between the abundance of mottling and soil color. Topography and ground water are also related to the determination of soil drainage classes.--Copyright 1973, Biological Abstracts, Inc.
W73-09421

INFLUENCE OF LAND-USE ON CERTAIN SOIL CHARACTERISTICS IN THE AFFORESTED AREA OF KHUNTI IN CHOTANAGPUR,
Ranchi Agricultural Coll., Kanke (India).
P. K. Roy, and B. P. Sahi.
Indian J Agric Sci. Vol 41, No 11, p 971-980. 1971.
Identifiers: *Soil properties, *Land use, Aggregates, Chotanagpur, Conductivity, Forests, Hydraulics, India, Khunti, Root penetration, Soils, Hydrogen ion concentration.

A comparative study of certain soil characteristics like root penetration, its abundance, hydraulic conductivity, volume of expansion and total water-stable aggregates was made under forest land, deforested barren land and cultivated land. The values of these characters declined on deforestation and cultivation. There was appreciable degradation in larger aggregates (2mm) to deforestation, which further degraded on cultivation. No differentiations in texture, pH and other physical constants were observed, probably because of sufficient weathering of soils. Organic matter and N were found in the descending order deforested land > forest land > cultivated land; this was probably due to thick grasses and shrubs in the deforested land. Most of the differences were observed in the surface layers and at the same site.--Copyright 1973, Biological Abstracts, Inc.
W73-09424

MOISTURE CONTENT OF SOILS FOR MAKING SATURATION EXTRACTS AND THE EFFECT OF GRINDING,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
J. Loveday.
Aust Commonw Sei Ind Res Organ Div Soils Tech Pap. 12, p 3-9. 1972. Illus.
Identifiers: *Soil moisture, *Analytical techniques, Extracts, Grinding, Moisture, Saturation, Soils, Wetting.

Details are given of the capillary wetting method for determining the moisture content at which to make saturated pastes for extracting the soluble ions. For other routine analysis it is recommended that samples be ground to 2 mm. The effect of different grinding machines was considerable, and it is suggested that laboratories using this wetting technique should standardize on a particular type of grinding machine.--Copyright 1973, Biological Abstracts, Inc.
W73-09425

EFFECTS OF SOIL AND MANAGEMENT FACTORS ON FERTILIZER RESPONSES AND YIELD OF IRRIGATED WHEAT IN IRAN,
For primary bibliographic entry see Field 03F.
W73-09436

DETERMINATION OF SILVER IN SOILS, SEDIMENTS, AND ROCKS BY ORGANIC-CHELATE EXTRACTION AND ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W73-09451

EFFECT OF SEEPAGE STREAM ON ARTIFICIAL SOIL FREEZING,
University Engineers, Inc., Norman, Okla.
H. T. Hashemi, and C. M. Sliepcevich.
ASCE Proceedings, Journal of the Soil Mechanics and Foundations Division, Vol 99, No SM3, Paper 9630, p 267-289, March 1973. 9 fig, 2 tab, 16 ref, 1 append. Army CRREL Grant DA-AMC-27-021-65-G19

Descriptors: *Freezing, *Frozen soils, *Groundwater movement, *Soil water movement, Numerical analysis, Soil mechanics, Frost, Thawing, Ice, Seepage, Heat transfer.

A numerical technique is presented for predicting the two-dimensional transient temperature distribution in freezing or thawing wet soil. The technique may be used for estimating the influence of seepage stream velocity on an artificial free-draining wet soil by a row of freeze pipes. Small groundwater flows perpendicular to the vertical axis of a freeze pipe have no significant effect on the rate of growth of the ice boundary in the horizontal direction. In fact, a flow of 0.01 cu ft per hr per sq ft to possibly 0.02 cu ft per hr per sq ft may even enhance the rate of propagation of the ice boundary. Increases in flow above those limits diminish the rate of growth of the ice boundary markedly. At a flow rate of 0.50 cu ft per hr per sq ft, closure of the ice boundary between a row of 6-inch freeze pipes with a center-to-center spacing of 8.6 ft will never occur. (Knapp-USGS)
W73-09454

CHEMICO-OSMOTIC EFFECTS IN FINE-GRAINED SOILS,
California Univ., Berkeley. Dept. of Civil Engineering.
J. K. Mitchell, J. A. Greenberg, and P. A. Witherspoon.
ASCE Proceedings, Journal of the Soil Mechanics and Foundations Division, Vol 99, No SM4, Paper 9678, p 307-322, April 1973. 5 fig, 2 tab, 12 ref, 1 append.

Descriptors: *Soil water movement, *Soil stabilization, *Osmosis, *Chemical potential, *Clays, Soils, Chemical reactions, Groundwater movement, Pore water, Seepage, Soil chemical properties, Soil physical properties, Soil physics, Soil treatment.

A theory describes the simultaneous coupled diffusional flow of salt and water in soils. The effects of coupling should increase as soil void ratio decreases and soil compressibility and salt concentration differences increase. Test results show that chemico-osmotic effects exist, and the rates of solution flow are in reasonable accord with theoretical predictions. Chemico-osmotic consolidation is likely to be small for most soils, except for very fine-grained active clays like bentonite. However, because chemico-osmotic coupling is capable of moving soil pore water and dissolved salts, chemico-osmotic soil stabilization might be feasible in some cases. (Knapp-USGS)
W73-09455

TRACE ELEMENTS IN SOILS AND FACTORS THAT AFFECT THEIR AVAILABILITY,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 05B.
W73-09468

DISTRIBUTION OF TRACE ELEMENTS IN THE ENVIRONMENT AND THE OCCURRENCE OF HEART DISEASE IN GEORGIA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-09469

DETERMINATION OF MERCURY IN SOILS BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Department of Scientific and Industrial Research, Petone (New Zealand).
For primary bibliographic entry see Field 05A.
W73-09471

SELENIUM DEFICIENCY IN SOILS AND ITS EFFECT ON ANIMAL HEALTH,
Oregon State Univ., Corvallis. Dept. of Animal Science.
For primary bibliographic entry see Field 02K.
W73-09476

LEAD IN SOILS AND PLANTS: A LITERATURE REVIEW,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 05B.
W73-09479

PYROPHOSPHATE HYDROLYSIS IN SOIL AS INFLUENCED BY FLOODING AND FIXATION,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
G. J. Racz, and N. K. Savant.
Soil Sci Soc Am Proc. Vol 36, No 4, p 678-682, 1972. Illus.
Identifiers: Fertilizers, Fixation, Flooding, *Hydrolysis, Phosphatase, *Pyrophosphate, *Soils.

The rate of hydrolysis of pyrophosphate (K4P2O7) in a noncalcareous soil maintained at field capacity moisture content or under flooded conditions was determined. Attempts were also made to study the influence of fixation of added pyrophosphate by soil on the rate of pyrophosphate hydrolysis. The initial rate of pyrophosphate hydrolysis was rapid and approximately the same for both flooded soil and soil maintained at field capacity moisture content. The first-order reaction rate constants, obtained by plotting the log of the concentration of unhydrolyzed pyrophosphate vs. time were 0.000814/min and 0.000837/min for soil at field capacity and under flooded conditions, respectively. However, after about 3 days of incubation, flooded soil hydrolyzed pyrophosphate at a relatively greater rate (k ± 0.000020/min) than did soil maintained at field capacity (k-0.000013/min). This difference appeared to be due to an increase in pyrophosphatase activity in the flooded soil. The half-life of the added pyrophosphate was approximately 2 days. Pyrophosphate adsorbed by an anion exchange resin or fixed by soil hydrolyzed at a slower rate than did pyrophosphate in solution. The ratio of orthophosphate to total phosphate (orthophosphate ± pyrophosphate) extracted from phosphated soils by various extractants decreased in the order; water, O1N H2SO4, and 0.5N2H4SO. Water-soluble or loosely bound pyrophosphate hydrolyzed at a much greater rate than did water-insoluble or strongly bonded pyrophosphate.--Copyright 1973, Biological Abstracts, Inc.
W73-09516

POTENTIOMETRIC TITRATION OF SULFATE IN WATER AND SOIL EXTRACTS USING A LEAD ELECTRODE,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02K.
W73-09518

GASEOUS LOSSES OF NITROGEN FROM FRESHLY WETTED DESERT SOILS,
Wisconsin Univ., Madison. Dept. of Soil Science.
A. N. Macgregor.
Soil Sci Soc Am Proc. Vol 36, No 4, p 594-596, 1972.
Identifiers: Denitrification, Desert soils, Gaseous losses, *Nitrogen, Nitrogen-15, *Soils, Spectrometry, Volatilization, Wetted soils.

On the basis of manometric data and mass spectrometer analyses, N2, and N2O were formed when samples from the dry surface of 2 semiarid soils were moistened and incubated under for 22-42 hr at 38 degC. Of the endogeneous soil nitrate-N present in each soil, approximately 60% was volatilized by Sonoita sandy loam (virgin desert soil). When either soil was amended with organic C, more gaseous N (N2 and N2O) was evolved than could be accounted for in terms of the initial level of endogenous nitrate. In 15N-experiments, N2O was derived primarily from nitrate. However, although significant amounts of N2 were evolved by soils, much of the N2 was unlabelled further suggesting nonnitrate sources play a role in volatilization of N from the soils under study.--Copyright 1973, Biological Abstracts, Inc.
W73-09519

HYDROLYSIS OF PROPAZINE BY THE SURFACE ACIDITY OF ORGANIC MATTER,
Agricultural Research Service, Beltsville, Md. Soils Lab.
For primary bibliographic entry see Field 05B.
W73-09520

CHARACTERIZATION OF THE OXIDIZED AND REDUCED ZONES IN FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
W. H. Patrick, Jr., and R. D. Delaune.
Soil Sci Soc Am Proc. Vol 36, No 4, p 573-576. 1972. Illus.
Identifiers: Ammonium, Flooded soil, Iron, Manganese, Nitrates, Oxygen, Soils, Sulfides, Zones, *Redox potential.

The oxidized and reduced layers in flooded soil were characterized by vertical distribution of the oxidation-reduction (redox) potential and concentrations of manganous Mn, ferrous Fe, sulfide, nitrate, and ammonium. Redox potential was measured with a special motor-driven assembly which advanced a Pt electrode at a rate of 2 mn/hr through the flooded soil profile. Vertical distribution of reduced forms of Mn, Fe and S and of nitrate and ammonium was determined by freezing and slicing the flooded soil into segments 1 or 2 mm thick. The apparent thickness of the oxidized layer was different when evaluated by the distribution of the various components in the profile, with the sulfide profile indicating the thickest oxidized zone, and Mn profile indicating the thinnest oxidized zone, and the Fe profile showing an intermediate thickness. The thickness of the oxidized layer increased with duration of flooding.--Copyright 1973, Biological Abstracts, Inc.
W73-09522

INFILTRATION AND SOIL PHYSICAL PROPERTIES,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
P. D. Fitzgerald, G. G. Cossens, and D. S. Rickard.
J Hydrol (Dunedin). Vol 10, No 2, p 120-126. 1971.
Identifiers: *Infiltration, Physical properties, *Regression analysis, *Soil properties.

An investigation was carried out into the relationship between soil physical properties and various infiltration parameters. The results of both simple and multiple regression analyses showed that there was little association. The technique of measuring infiltration by the double ring method is responsible for this lack of association.--Copyright 1972, Biological Abstracts, Inc.
W73-09530

RICE RESPONSE TO ZN IN FLOODED AND NONFLOODED SOIL,
Tennessee Valley Authority, Muscle Shoals, Ala. Soils and Fertilizer Research Branch.
For primary bibliographic entry see Field 03F.
W73-09551

EFFECT OF AERIAL ENVIRONMENT AND SOIL WATER POTENTIAL ON THE TRANSPIRATION AND ENERGY STATUS OF WATER IN WHEAT PLANTS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 03F.
W73-09570

LONG-TERM GRAZING EFFECTS ON STIPA--BOUTELOUA PRAIRIE SOILS.
Department of Agriculture, Lethbridge (Alberta). Research Station.
S. Smoliak, J. F. Dormarr, and A. Johnston.
J Range Manage. Vol 25, No 4, p 246-250, 1972. Illus.
Identifiers: *Canada (Alberta), Carbon, *Grazing, Moisture, *Prairie soils, Saccharides, Sheep, Soils, *Stipa-Bouteloua, Hydrogen ion concentration.

The effects of grazing on prairie soils in Alberta were evaluated after 19 yr of continuous summer use by sheep at 3 stocking intensities. Analysis of the soils under the heavy grazing treatment showed lower values for pH and percent spring moisture but higher values for total C, alcohol/benzene-extractable C, alkaline-soluble C, polysaccharides, and belowground plant material than the soil under light or no grazing. The results were attributed to changes in amounts and kinds of roots due to species changes caused by grazing and to increased amounts of manure deposited by sheep on fields grazed at a higher intensity. Shallow-rooted species replaced the deeper-rooted ones on the drier environment induced by heavy grazing.--Copyright 1973, Biological Abstracts, Inc.
W73-09579

DEVELOPMENT OF GRASS ROOT SYSTEMS AS INFLUENCED BY SOIL COMPACTION,
Agricultural Research Service, Big Springs, Tex.
For primary bibliographic entry see Field 03F.
W73-09580

EFFECT OF SOIL MANAGEMENT ON CORN YIELD AND SOIL NUTRIENTS IN THE RAIN FOREST ZONE OF WESTERN NIGERIA,
Iban Univ. (Nigeria). Dept. of Agronomy.
For primary bibliographic entry see Field 03F.
W73-09581

SOIL MANAGEMENT FACTORS AND GROWTH OF ZEA MAYS L. ON TOPSOIL AND EXPOSED SUBSOIL,
For primary bibliographic entry see Field 03F.
W73-09582

STUDIES ON THE PERMEABILITY OF SOME TYPICAL SOIL PROFILES OF RAJASTHAN IN RELATION TO THEIR PORE SIZE DISTRIBUTION AND MECHANICAL COMPOSITION,
Udaipur Univ. (India). Coll. of Agriculture.
K. S. Singh, and G. Singh.
Ann Arid Zone. Vol 10, No 2/3, p 105-110. 1971.
Identifiers: Distribution, *India (Rajasthan), Mechanical composition, *Permeability, *Pore size, Soil profiles, Size.

The permeability of the soil profiles in general decreased downwards. The coefficient of permeability of Dungargarh soil was highest and of Kota was lowest at all depths. Capillary porosity and silt plus clay content of the soil samples were negatively correlated, whereas non-capillary porosity, total pore space and sand content were positively correlated with the coefficient of permeability. Capillary porosity, silt plus clay percent, non-capillary porosity and sand percent were significantly correlated with permeability. The relationship between the coefficient of permeability and percent total pore space was not significant.--Copyright 1973, Biological Abstracts, Inc.

W73-09583

MAKARA, IHD EXPERIMENTAL BASIN NO 6, 1968-1970,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 02A.
W73-09596

MOUTERE, IHD EXPERIMENTAL BASIN NO 8, 1971,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 02A.
W73-09597

INFILTRATION OF WATER INTO SOILS AS INFLUENCED BY SURFACE SEAL DEVELOPMENT,
Agricultural Research Service, Coshocton, Ohio. Corn Belt Branch.
W. M. Edwards, and W. E. Larson.
American Society of Agricultural Engineers Transactions, Vol 12, No 4, p 463-470, July/August, 1969. 4 fig, 2 tab, 6 ref.

Descriptors: *Soil water movement, *Infiltration rates, *Surface sealing, Forecasting, Numerical analysis, Equations, Computer programs, Input-output analysis, Soil properties.

A numerical solution of the waterflow equation for estimating infiltration into a homogeneous soil was used to describe the effect of a developing surface seal on infiltration of water. Saturated conductivity for the surface 0.5 cm of six Ida silt loams was determined as a function of length of exposure to simulated rainfall and used in the computer solution to describe infiltration into a soil, the surface of which is exposed to raindrop impact. Estimated two-hour infiltration was reduced by as much as 50 percent by surface sealing. The suction gradient through the surface seal increased with decreasing conductivity of the seal and with increasing conductivity of the layer below the seal. (Woodard-USGS)
W73-09607

CRITICAL SOIL MOISTURE LEVELS FOR FIELD PLANTING FOURWING SALTBUSH,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon.
Journal of Range Management, Vol 25, No 4, July 1972, p 311-312. 2 fig, 7 ref.

Descriptors: *Soil moisture, *Planting management, *Soil stabilization, *Plant growth regulators, *Limiting factors, Forages, Grazing, Wildlife, Sediment control, Flood plains, Crop production, Revegetation, Moisture stress, Moisture contents, Summer, Thunderstorms, Southwest U.S., New Mexico, Treatment.
Identifiers: *Transplants, Survival, Ground level.

Because fourwing saltbush is an excellent soil stabilizer, a nutritious all-season forage for grazing animals, food and cover for wildlife, and a sediment trap on alluvial floodplains, much recent effort has gone into determining methods of saltbush establishment on devastated areas. This study in north central New Mexico determines minimum levels of soil moisture for successful field plantings. Six different alluvial bottom sites were planted with transplants. Soil samples were taken for gravimetric determination of soil moisture. Survival of fourwing saltbush transplants was at least 80 per cent when field sites had soil moisture levels of at least 14 per cent by weight or were at tensions between one-third and 2 atmospheres. Use of native seed for transplants and placement at ground level is also important for survival. Successful planting depends on the probability for sizable summer thunderstorms in the Southwest. (Popkin-Arizona)
W73-09683

FACTORS INFLUENCING INFILTRATION AND EROSION ON CHAINED PINYON-JUNIPER SITES IN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
G. Williams, G. F. Gifford, and G. B. Coltharp.
Journal of Range Management, Vol 25, No 3, May 1972, p 201-205. 1 fig, 1 tab, 13 ref. Bureau of Land Management 14-11-0008-2837.

Descriptors: *Infiltration, *Erosion, *Pinyon-juniper trees, *Juniper trees, *Hydrologic properties, Limiting factors, Vegetation, Soil properties, Infiltrometers, Simulated rainfall, Controls, Sediments, Runoff, Soil texture, Bulk density, Organic matter, Porosity, Moisture content, Regression analysis, Forecasting, Variability, Time, Semiarid climates, *Utah, Great Basin.
Identifiers: Woodland.

Many factors influence infiltration in semiarid lands. Defining them is requisite to understanding hydrologic behavior of the 61.4 million acres of pinyon-juniper woodland in the western United States. This study reports the influence of vegetal and edaphic factors on infiltration and sediment production rates of pinyon-juniper sites in Utah. A Rocky Mountain infiltrometer was used to simulate high intensity rainfall on 2.5 sq ft plots for 550 trials on 28 chain-treated and 28 untreated field sites. Plots were pre-wet, runoff and sediment were measured and soil surface characteristics were determined. Parameters of interest include vegetal crown cover, soil texture, bulk density, organic matter, soil porosity and moisture content. Multiple regression analysis was performed. Ability to predict infiltration rates varied with time and location. Time of event, location, infiltration rates and erosion were important considerations. The predictive regression equations are not given in the paper, though the percent variance and other statistical properties are discussed. Factors influencing sediment discharge were so variable that no consistent relationship was found. The complexity that exists with regard to hydrologic phenomenon is recognized. Geographic areas, parameters of interest, and timing of an event should be considered. (Popkin-Arizona)
W73-09684

2H. Lakes

HYPOLIMNION REAERATION OF SMALL RESERVOIRS AND LAKES,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 05G.
W73-09103

CIRCULATION PATTERNS IN LAKE SUPERIOR,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering; and Wisconsin Univ., Madison. Dept. of Meteorology.
J. A. Hoopes, R. A. Ragotzkie, S. L. Lien, and N. P. Smith.
Available from the National Technical Information Service as PB-220 244, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, April 1973. 80 p, 1 tab, 79 fig, 64 ref. OWRR B-009-WIS (5) 14-01-0001-1057.

Descriptors: *Lake Superior, Air circulation, Lake breezes, Lakes, Mixing, *Water circulation, Stratification, Winds, *Bathythermography, *Water temperature, *Currents (Water), Coriolis force, Model studies, *Mathematical models, *Energy transfer, Movement.
Identifiers: Keweenaw Peninsula, Isle Royale.

Lake circulation studies were directed toward Lake Superior for the purpose of broadening the quantitative understanding of large-scale circulation patterns induced by wind and atmospheric pressure variations over lakes under homogeneous and stratified conditions. One phase considers the numerical and physical modelling of lake circulation under uniform density conditions. The effects of lake geometry and wind stress distributions on the movement of water are considered. Coriolis forces were considered in the models. The second phase involves the analysis and interpretation of field observations of currents and temperatures for the central region of Lake Superior, between the Keweenaw Peninsula and Isle Royale during seasons when lake stratification conditions predominate. Bathythermography data and airborne infrared surface temperature surveys were collected at the same time to permit the investigators to make inferences about the temperature structure of the interior of the lake, given only the surface temperature pattern. By using a diverse approach of combining many sampling techniques and methods of analysis, it was possible to detect and define the nature of the temperature and current patterns for the study area. (Kerrigan-Wisconsin)
W73-09106

A PROPOSAL FOR IMPROVING THE MANAGEMENT OF THE GREAT LAKES OF THE UNITED STATES AND CANADA.
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06E.
W73-09110

CHEMICAL QUALITY OF SURFACE WATER IN THE FLAMING GORGE RESERVOIR AREA, WYOMING AND UTAH,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-09127

HYDROLOGIC INVESTIGATIONS OF PRAIRIE POTHOLES IN NORTH DAKOTA, 1959-68,
Geological Survey, Washington, D.C.
W. S. Eisenlohr, Jr.
Geological Survey Professional Paper 585-A, 1972. 102 p, 92 fig, 3 plate, 34 tab, 48 ref.

Descriptors: *Potholes, *Ponds, *Water balance, *Salinity, *Wetlands, Evapotranspiration, Glacial drift, Hydrogeology, Evaporation, Seepage, Habitats, Topography, Grasslands, *North Dakota.
Identifiers: *Prairie potholes.

Prairie potholes, a result of glacial processes, are depressions capable of storing water. Large numbers of them have been drained for agricultural use. This report discusses prairie potholes in the Coteau du Missouri, the eastern part of the glaciated northern Great Plains region in North Dakota. It is a rolling upland covered with glacial drift. Seasonal evaporation from potholes clear of vegetation was found to very nearly equal the generalized evaporation values published by the U.S. Weather Bureau. The effect of hydrophytes in potholes was twofold; their presence reduced evaporation from the water surfaces; and at the height of the growing season their transpiration rate, added to the reduced evaporation rate, was frequently greater than the evaporation rate from potholes clear of vegetation. Net seepage outflow from potholes was generally very small--less than 0.01 foot per day per unit of water surface. This rate of seepage was not insignificant, however, because it often amounted to more than one-fourth of the total seasonal loss of water from a pothole. The source of water was primarily precipitation on the water surface of a pothole pond. Augmenting this supply was basin inflow, including overland flow, flow in channels, and seepage inflow. Where

there is no overflow or seepage outflow, there is no mechanism for the removal of dissolved solids brought to the pond by basin inflow. Such potholes are saline. The species of vegetation are excellent indicators of water quality and permanence of ponds. (Knapp-USGS)
W73-09130

SEDIMENTATION AND PHYSICAL LIMNOLOGY IN PROGLACIAL MALASPINA LAKE, ALASKA,
Massachusetts Univ., Amherst. Coastal Research Center.
For primary bibliographic entry see Field 02J.
W73-09141

A SELECTED ANNOTATED BIBLIOGRAPHY OF THE CLIMATE OF THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
H. Hacia.
Available from NTIS, Springfield, Va 22151 as COM-72 10830, Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum EDS BS-7, March 1972. 70 p, 201 ref.

Descriptors: *Climatology, *Great Lakes, *Bibliographies, *Abstracts, *Publications, Meteorology, Precipitation (Atmospheric), Storms, Weather modification, Temperature, Water balance, Water levels, Winds, Waves, Solar radiation, Vapor pressure, Humidity.

This Selected Annotated Bibliography (201 entries) of the Climate of the Great Lakes has been compiled from readily available materials, particularly the American Meteorological Society's Meteorological and Geoastrophysical Abstracts (MGA), January 1960 through April 1971, and National Oceanic and Atmospheric Administration (NOAA) Atmospheric Sciences Library (DAS) files. Atmospheric Sciences Library call numbers are recorded with entry if available. (Woodard-USGS)
W73-09149

CONCENTRATIONS OF BIOGENIC ELEMENTS IN THE MOZHAYSK RESERVOIR (ZAPASY BIOGENNYKH ELEMENTOV V MOZHAYSKOM VODOKHRANILISHCHE),
Moscow State Univ. (USSR). Chair of Hydrology.
M. A. Khrustaleva.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 4, p 77-80, 1972. 4 tab, 2 ref.

Descriptors: *Trace elements, *Reservoirs, *Water chemistry, Water sampling, Water analysis, Nitrogen, Phosphorus, Iron, Inorganic compounds, Nitrates, Nitrites, Seasonal.
Identifiers: *USSR, *Mozhaysk Reservoir, Silicon.

Investigations of the content of biogenic elements in waters of the Mozhaysk Reservoir in Moscow Oblast were based on analysis of 562 water samples collected during different seasons in 1968-70. The elements examined were nitrogen, phosphorus, iron, and silicon. Large concentrations of the elements observed in the dry year of 1969 were 1.7 times those in the moderately wet year of 1968 and 1.9 times those in the wet year of 1970. (Josefson-USGS)
W73-09151

THE EIGHTEENTH INTERNATIONAL LIMNOLOGY CONGRESS AT LENINGRAD (XVIII MEZHDUNARODNYY LIMNOLOGICHESKIY KONGRESS V LENINGRADE),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
L. L. Rossolimo.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 1, p 151-156, January-February 1972.

Descriptors: *Conferences, *Limnology, *Bodies of water, *Lakes, Reservoirs, Aquatic environment, Aquatic life, Benthos, Aquatic productivity, Eutrophication, Ecology, Ecosystems, Microbiology, Fish management, Parasitism, Water chemistry, Water quality, Water pollution, Self-purification, Meteorology.
Identifiers: *USSR.

The Eighteenth International Congress on Limnology, held in Leningrad, August 19-26, 1971, was attended by 820 scientists from 34 countries, including 425 from the Soviet Union. Of the 300 papers presented at the Congress, 75 were delivered by Soviet delegates. The papers focused on general limnology, applied limnology, hydrometeorology, primary production, primary production and phytoplankton, hydrochemistry, microbiology, fish biology and fish management, ecology of aquatic organisms, zooplankton, benthos, and reservoirs. Plenary sessions were devoted to problems of general and regional limnology; bodies of water with regulated flow; heightened fish productivity in inland bodies of water by acclimatization of fishes and food invertebrates and by other means; and water quality and self purification of bodies of water. Symposia dealt with such specific topics as interactions between land and water; paleolimnology; parasites and productivity of fishes in fresh bodies of water; and regional productivity of the Vimba vimba species. (Josefson-USGS)
W73-09159

OCCURRENCE OF FREE AMINO ACIDS IN POND WATER,
Polish Academy of Science, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09174

WISCONSIN LAKES RECEIVING SEWAGE EFFLUENTS,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05B.
W73-09176

SOLAR RADIATION, WATER TEMPERATURE AND PRIMARY PRODUCTION IN CARP PONDS,
Polish Academy of Sciences, Golysz. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09181

PHYTOPLANKTON OF FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09183

BIOMASS OF ZOOPLANKTON AND PRODUCTION OF SOME SPECIES OF ROTATORIA AND DAPHNIA LONGISPINA IN CARP PONDS,
Polish Academy of Sciences, Golysz. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09184

CILIATA IN BOTTOM SEDIMENTS OF FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09185

PRODUCTION OF MACROBENTHOS IN FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09186

BIOMASS AND PRODUCTION OF CARP FRY IN DIFFERENTLY FERTILIZED FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09187

THE HORIZONTAL DIFFERENTIATION OF THE BOTTOM FAUNA IN THE GOPLO LAKE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W73-09189

ZOOPLANKTON OF THE BAY PART OF GOPLO LAKE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W73-09190

BOTTOM FAUNA OF THE BAY PART OF GOPLO LAKE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W73-09191

THE BOTTOM FAUNA OF THE WATER RESERVOIRS WHICH NEWLY CAME INTO THE NEIGHBOURHOOD OF THE KORONOWO DAM RESERVOIR,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
For primary bibliographic entry see Field 05C.
W73-09192

SOME EFFECTS OF WATER LEVEL ON THE REPRODUCTIVE SUCCESS OF THE WHITE PELICAN AT EAST SHOAL LAKE, MANITOBA,
Manitoba Univ., Winnipeg. Dept. Zoology.
R. M. Evans.
Can Field Nat. Vol 86, No 2, p 151-153. 1972.
Identifiers: *Canada, East Shoal Lake (Manitoba), Pelecanus-erythrorhynchos, *Pelicans, *Reproductive, Shoal, Water level.

Historical records combined with personal observations from 1967 to 1971 indicate that islands which become unsuitable for breeding due to water level changes may be recolonized when breeding habitat of white pelican (Pelecanus erythrorhynchus) is restored.–Copyright 1973, Biological Abstracts, Inc.
W73-09195

FIXATION OF ATMOSPHERIC NITROGEN BY AZOTOBACTER SP., AND OTHER HETEROTROPHIC OLIGONITROPHILOUS BACTERIA IN THE ILAWA LAKES,
Wyzsza Szkola Rolnicza, Olsztyn-Kortowo (Poland). Instytut Inzynierii i Biotechnolgii Zywnosci.
For primary bibliographic entry see Field 05C.
W73-09196

REPRODUCTIVE POTENTIAL OF THE BLACK BULLHEAD, ICTALURUS MELAS, IN CLEAR LAKE, IOWA,
Metropolitan Sanitary District of Greater Chicago, Ill. Research and Development Lab.
S. G. Dennison.

Trans Am Fish Soc. Vol 101, No 3, p 483-487. 1972. Illus.
Identifiers: *Bullheads (Black), Ictalurus-melas, *Iowa, Lakes, *Reproduction (Fish).

Gonadal development, time of sqawning, and fecundity of black bullheads were examined in 1969 and 1970 for insight into the reproductive potential of this species in a warm-water lake. Maturity indexes peaked around 1 June in both years. Spawning was evidently triggered by rising water temperatures during June. Fecundity seemed unrelated to body length because ovaries of fish of similar length varied more than 100% in number of mature ova present.--Copyright 1973, Biological Abstracts, Inc.
W73-09197

COMPARATIVE STUDY OF THE LIMNOLOGY OF TWO SMALL LAKES ON ROSS ISLAND, ANTARCTICA,
California Univ., Davis. Div. of Environmental Studies; and California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W73-09199

PROFILES OF CHLOROPHYLL CONCENTRATIONS BY IN VIVO FLUORESCENCE: SOME LIMNOLOGICAL APPLICATIONS,
Kinneret Limnological Lab., Tiberias (Israel).
For primary bibliographic entry see Field 05C.
W73-09200

SEASONAL ABUNDANCE OF ANCYROCEPHALINAEN (MONOGENOIDEA) PARASITES OF BLUEGILL, LEPOMIS MACROCHIRUS (RAF),
Georgia Univ., Athens. School of Forest Resources.
M. V. Rawson, and W. A. Rogers.
J Wildl Dis. Vol 8, No 3, p 255-260, 1972. Illus.
Identifiers: Abundance, Actinocleidus-Fergusoni, Anchoradiscus-Triangularis, *Ancyrocephalinaen parasites, *Bluegill, Clavunculus-Bifurcatus, Cleidodiscus-Nematocirrus, Cleidodiscus-Robustus, Lepomis-Macrochirus, Lyrodiscus-Seminolensis, *Monogenoidea, Parasites, Seasonal, Urocleidus-Dispar, Urocleidus-Ferox, Uroleidus-Acer, *Georgia.

Species (9) of Monogenea of the subfamily Ancyrocephalinae were collected from L. macrochirus in Walter F. George Reservoir at 2 wk intervals from Dec. 1967-Jan. 1969. The abundance patterns and size of the organism formed 3 distinct groups: The large species most abundant during the autumn and least abundant during the mid-summer period were Anchoradiscus triangularis and Clavunculus bifurcatus; the large species most abundant during the spring and least abundant during the mid-summer period were Lyrodiscus seminolensis and Cleidodiscus robustus and the small species abundant during the summer but having a prewinter peak at water temperatures near 10 degC were Actinocleidus fergusoni, Urocleidus dispar, U. ferox, U. acer and Cleidodiscus nematocirrus.--Copyright 1973, Biological Abstracts, Inc.
W73-09251

PREDICTION OF WATER QUALITY IN STRATIFIED RESERVOIRS,
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.
For primary bibliographic entry see Field 05B.
W73-09272

MORTALITY AND SURVIVAL RATES OF TAGGED LARGEMOUTH BASS (MICROPTERUS SALMOIDES) AT MERLE COLLINS RESERVOIR,
California State Dept. of Fish and Game, Sacramento.
R. A. Rawstron, and K. A. Hashagen, Jr.
Calif Fish Game. Vol 58, No 3, p 221-230, 1972.
Identifiers: *Bass (Large mouth), Exploitation, Merle-Collins, Micropterus-Salmoides, *Mortality, Reservoirs, *Survival, Tagged fish, *California.

A tagging study from 1965 through 1969 revealed that exploitation rates of largemouth bass increased after the first season following impoundment, reaching a high of 0.65 in 1968 and 1970. Annual survival rates generally increased and stabilized near 0.2. Natural mortality declined. A combination of the highest reported exploitation rates, reduced annual catches, lowered catch/hour, increased bluegill populations,and competition with smallmouth bass and threadfin shad indicate possible continued depletion and overexploitation of largemouth bass.--Copyright 1973, Biological Abstracts, Inc.
W73-09277

DIFFERENTIAL SEASONAL MIGRATION OF THE CRAYFISH, ORCONECTES VIRILIS (HAGEN), IN MARL LAKES,
Ohio State Univ., Columbus. Dept. of Zoology.
H. Gowing.
Ecology. Vol 53, No 3, p 479-483. 1972. Illus.
Identifiers: *Crayfish, Gonads, Lakes, *Marl lakes, Maturation, *Michigan, Migration, Orconectes-virilis, *Seasonal migration.

In an earlier study during 1962 and 1963, movement of female O. virilis from shallow to deeper water in summer was noted in West Lost Lake, Otsego County, Michigan. The present additional observations on O. virilis, during 3 summers and in 3 lakes, confirm this migration. Evidence from other areas suggest that this movement is a general phenomenon of the species throughout most of its range. Migration of females appears to be associated essentially with maturation of the gonads.--Copyright 1973, Biological Abstracts, Inc.
W73-09303

VITAL STATISTICS, BIOMASS, AND SEASONAL PRODUCTION OF AN UNEXPLOITED WALLEYE (STIZOSTEDION VITREUM VITREUM) POPULATION IN WEST BLUE LAKE, MANITOBA,
Ministry of Natural Resources, Port Dover (Ontario).
J. R. M. Kelso, and F. J. Ward.
J Fish Res Board Can. Vol 29, No 7, p 1043-1052. 1972. Illus.
Identifiers: *Biomass, *Canada (Manitoba), Lakes, Seasonal production, Statistics, Stizostedion-vitreum-vitreum, *Walleye, *West Blue Lakes.

The population of S. vitreum vitreum, (25 cm and greater) in West Blue Lake, Man., in May 1969 decreased from 1090-819 in May 1970. During summer and fall, the intial population was supplemented by new recruits, age II+; reaching a maximum of 3451 in Sept. 1969. The total population in May 1970 was 2037. Mean daily mortality for all ages was small for the year, 0.0045, but loss rate was greater in fall and winter. Growth in length was greatest for age II+ followed by older fish. Growth in weight was similar for ages III-V and lowest for age II+. Mean biomass, approximately 800 kg, was similar in May 1969 and May 1970. Production, 340 kg, coincided with the growing season (June to Oct.) and was greatest from June to Sept. Greatest contribution to walleye production and biomass was made by age II+ fish. During winter and spring, zero or negative production occurred.--Copyright 1973, Biological Abstracts, Inc.
W73-09309

COPEPODS OF MARINE AFFINITIES FROM MOUNTAIN LAKES OF WESTERN NORTH AMERICA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05C.
W73-09325

ECOLOGICAL OBSERVATIONS ON HETEROTROPHIC, METHANE OXIDIZING AND SULFATE REDUCING BACTERIA IN A POND,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 05A.
W73-09337

LIMNOLOGICAL INVESTIGATIONS IN THE AREA OF ANVERS ISLAND, ANTARCTICA,
Virginia Polytechnic Inst. Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-09339

ON THE QUANTITATIVE CHARACTERISTICS OF THE PELAGIC ECOSYSTEM OF DALNEE LAKE (KAMCHATKA),
For primary bibliographic entry see Field 05C.
W73-09340

TROUT IN LLYN ALAW, ANGLESEY, NORTH WALES: II. GROWTH,
Liverpool Univ. (England). Dept. of Zoology.
P. C. Hunt, and J. W. Jones.
J Fish Biol. Vol 4, No 3, p 409-424. 1972. Illus.
Identifiers: Anglesey, Growth, *Llyn-Alaw (No. Wales), *Trout growth, *Wales.

The annual and seasonal growth, length/weight relationship, changes in seasonal condition and specific growth rates of 17 types of trout in the newly flooded reservoir, Llyn Alaw, in Anglesey, North Wales, were investigated. Scales and length-weight data from 2076 trout caught by angling and netting during the first 4 yr after impoundment were analyzed to show the age, origins and growth of all fish both before and after flooding.--Copyright 1973, Biological Abstracts, Inc.
W73-09342

FINE STRUCTURE OF SOME BRACKISH--POND DIATOMS,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
For primary bibliographic entry see Field 05A.
W73-09353

FIRST FOOD OF LARVAL YELLOW PERCH, WHITE SUCKER, BLUEGILL, EMERALD SHINER, AND RAINBOW SMELT,
National Water Quality Lab., Duluth, Minn.
R. E. Siefert.
Trans Am Fish Soc, Vol 101, No 2, p 219-225, 1972, Illus.
Identifiers: *Eutrophic lake, Bluegill, Bosmina-coregoni, Catostomus-commersoni, Cyclops-bicuspidatus, Food, *Larval stages (Fish), Lepomis-macrochirus, Notropis-atherinoides, Osmerus-mordax, Perca-flavescens, Perch, Polyarthra, Shiner, Smelt, Sucker, Trichocera, *Copepod.

Entire digestive tract contents from larval yellow perch (Perca flavescens (Mitchill)), white sucker (Catostomus commersoni (Lacepede)), bluegill (Lepomis macrochirus Rafinesque), emerald shiner (Notropis atherinoides Rafinesque), and rainbow smelt (Osmerus mordax (Mitchill)), along with plankton samples taken concurrently with fish samples, were identified and counted. Food selection was calculated by use of Ivlev's electivity index. First food of yellow perch from an eutrophic lake were copepod nauplii and cyclopoid

copepods; after fish reached 11 mm in length Bosmina coregoni was the dominant food. Yellow perch from an oligotrophic lake fed first on the rotifer Polyarthra, and to a lesser extent on copepod nauplii; after fish reached 11 mm cyclopoid copepods became the most important food items. Rotifers contributed an important portion of the early diet of white sucker; copepod nauplii and Cyclops bicuspidatus provided the remainder of the diet. Cladocerans increased in numbers after the fish reached 14 mm. Food of bluegills at the initiation of feeding consisted of Polyarthra and copepod nauplii. When fish reached 7 mm other rotifers and cyclopid copepods appeared in the diet, and at 8mm cladocerans become the dominant food and remained so for larger fish. Rotifers, mainly Trichocera, were the dominant food of 1st-feeding emerald shiners, and they remained an important food of larger fish. Copepod nauplii became a dominant food when fish reached 10 mm, and Cyclops bicuspidatus and cladocerans were important foods in fish 7 mm and larger. Algae were found in fish of all sizes, and calanoid copepods were found in fish 13 mm and larger. First-feeding rainbow smelt contained C. bicuspidatus, copepod nauplii, diatom, and green algae; C. bicuspidatus was the principal food until fish reached 21 mm. Calanoid copepods succeeded as the dominant food for larger fish. Electivity indices showed the following to be highly selected prey of fish at the initiation of feeding: yellow perch-Polyarthra and cyclopoid copepods; bluegill-Polyarthra; emerald shiner-rotifers and copepod nauplii; and rainbow smelt-C. biscuspidatus and copepod nauplii. Selection of food among the fish species studied was similar. Necessary criteria of a desirable prey include small size, the inability to escape capture, close proximity to the predator by swimming movements.--Copyright 1973, Biological Abstracts, Inc.
W73-09372

WINTER FOOD OF TROUT IN THREE HIGH ELEVATION SIERRA NEVADA LAKES,
Bureau of Sport Fisheries and Wildlife, Bishop, Calif.
G. V. Elliot, and T. M. Jenkins, Jr.
Calif Fish Game. Vol 58, No 3, p 231-237. 1972.
Identifiers: Fish food, Lakes, Salmo-Gairdneri, Salvelinus-Fontinalis, *Sierra-Nevada lakes, *Trout (Brook), Winter, *Trout (Rainbow).

A year-round analysis of trout stomach contents from 3 high elevation Sierra Nevada lakes showed that brook trout (Salvelinus fontinalis) and rainbow trout (Salmo gairdneri) fed on a variety of aquatic prey throughout the winter. However, under-ice feeding was poor relative to summer feeding even when the loss of surface forms is accounted for. Since fish were active and readily caught with bait at temperatures of 1C, poor feeding was due to reduced availability of important aquatic prey species rather than to a change in trout activity or readiness to feed.--Copyright 1973, Biological Abstracts, Inc.
W73-09417

DEVELOPMENT OF A SPORT FISHERY FOR LANDLOCKED SALMON IN A RECLAIMED POND,
Maine Dept. of Inland Fisheries and Game, Bangor.
For primary bibliographic entry see Field 08I.
W73-09419

REMOTE SENSING OF NEW YORK LAKES,
Geological Survey, Albany, N.Y.
J. M. Whipple.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C243-C247, 1972. 3 fig, 6 ref.
Descriptors: *Remote sensing, *Lakes, *New York, Infrared radiation, Water temperature, Thermal stratification, Limnology, Lake Ontario, Air-water interfaces, Mixing, Turnovers, Lake ice.
Identifiers: *Cayuga Lake (N Y), *Onondaga Lake (N Y).

Reverse flow through the outlet of Onondaga Lake and thermal activity associated with the spring mixing of Cayuga Lake were discerned on thermal-infrared imagery. Thermal radiances of natural and artificial discharges into Lake Ontario were measured, delineating the thermally pulsating nature of discharges into the open lake and thermal relationships between water masses. Quantitative imagery (radiometry) is useful in defining energy exchanges at the air-water interface. (Knapp-USGS)
W73-09447

SOME ALGAE COLLECTED FROM MT. TAYUAN, ILAN,
T-P Chang.
Quart J Taiwan Mus, Vol 23, No 1/2, p 127-134, 1970, Illus, Map.
Identifiers: *Algae (Alpine), Daphnia, Ilan, Mountains, Mt. Tayuan, Plankton, Species, *Taiwan, Zooplankton, *Green Peak Lake (Taiwan).

Alpine algae were collected at Green Peak Lake, which is 10 ha in area. Because the lake is surrounded by peaks (about 2300 m above sea-level), the lake accumulates mountain water from the creeks draining them. As the collection was procured in the dry season, a bare shore remained between the water margin and the grassy bank. The water color was due to the richness of zooplankton, especially Daphnia. Mt. Ali is the only Taiwanese locality to have algal samples studied. Although almost all the alga species listed are new to Taiwan, they are taxa commonly found in alpine habitats in other countries.--Copyright 1973, Biological Abstracts, Inc.
W73-09470

PHYTOPLANKTON SUCCESSION IN A EUTROPHIC LAKE WITH SPECIAL REFERENCE TO BLUE-GREEN ALGAL BLOOMS,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
For primary bibliographic entry see Field 05C.
W73-09534

AN EXPERIMENTAL STUDY OF FEEDING BEHAVIOR AND INTERACTION OF COASTAL CUTTHROAT TROUT (SALMO CLARKI CLARKI) AND DOLLY VARDEN (SALVELINUS MALMA),
Department of Fisheries and Forestry, Vancouver (British Columbia). Fisheries Service.
D. C. Schutz, and T. G. Northcote.
J Fish Res Board Can. Vol 29, No 5, p 555-565, 1972. Illus.
Identifiers: *Fish feeding behavior, Coastal lakes, *Dolly Varden, Salmo-Clarki-Clarki, Salvelinus-Malma, *Trout (Cutthroat).

Feeding behavior of S. clarki clarki and Dolly Varden S. malma cohabiting a small coastallake was studies experimentally to examine the importance of food exploitation as a mechanism for spatial and food segregation observed there. The hypothesis that Dolly Varden could feed more successfully on benthic prey, and cutthroat on surface prey was supported by laboratory experiments involving isolated individuals and interspecies pairs exposed to food in benthic, surface, and both locations. Differences between the species were found in resting and orientation positions and in behavior associated with food searching, location, and capture. Dolly Varden also were more successful than cutthroat in capturing benthic prey at low light intensities. Observed differences in feeding between the species were fully expressed in solitary individuals and did not appear to be magnified by interaction. It is suggested that these differences in sympatric stocks of the 2 species may be inherent and, therefore, that segregation is largely selective rather than interactive, even though the populations still retain considerable plasticity, enabling them to change diets or habitats when necessary or advantageous.--Copyright 1972, Biological Abstracts, Inc.
W73-09544

PHYTOPLANKTON, PHOTOSYNTHESIS, AND PHOSPHORUS IN LAKE MINNETONKA, MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W73-09546

MICROBIOLOGICAL STUDIES OF THERMAL HABITATS OF THE CENTRAL VOLCANIC REGION, NORTH ISLAND, NEW ZEALAND,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 05C.
W73-09554

SOME FACTORS ASSOCIATED WITH FLUCTUATION IN YEAR-CLASS STRENGTH OF SAUGER, LEWIS, AND CLARK LAKE, SOUTH DAKOTA,
Bureau of Sport Fisheries and Wildlife, Yankton, S. Dak. North Central Reservoir Investigations.
C. H. Walburg.
Trans Am Fish Soc. Vol 101, No 2, p 311-316, 1972. Illus.
Identifiers: Fluctuation, Lakes, *Sauger, *South Dakota, Spawning, Stizostedion-Canadense, Year, *Lewis and Clark Lake (S. Dak), Year-class strength.

The strength of sauger, Stizostedion canadense (Smith), year classes in Lewis and Clark Lake has fluctuated widely since formation of the reservoir in 1956. Studies suggest that more than 80% of the variability in year-class strength measured from the catch of fish older than age 0 and can be predicted from knowledge of water level change over the spawning ground, June reservoir water temperature, and reservoir water exchange rate. These factors were measured and probably function during the first 2 mo. of fish life. Sauger year classes of better than average strength can be expected in most years if both power-peaking operations at Fort Randall Dam during the fish spawning and incubation period, and the reservoir water exchange rate during June are minimized.--Copyright 1973, Biological Abstracts, Inc.
W73-09558

DIATOMS FOUND IN A BOTTOM SEDIMENT SAMPLE FROM A SMALL DEEP LAKE ON THE NORTHERN SLOPE, ALASKA,
For primary bibliographic entry see Field 05C.
W73-09622

THE VARIATIONS IN THE DISSOLVED OXYGEN AND TOTAL PHOSPHORUS CONCENTRATIONS IN LAKE GENEVA DURING THE YEARS 1969 AND 1970 (IN FRENCH),
Societe Vaudoise des Sciences Naturelles, Lausanne (Switzerland).
For primary bibliographic entry see Field 05B.
W73-09653

THE MER BLEUE SPHAGNUM BOG NEAR OTTAWA: II. SOME ECOLOGICAL FACTORS, (IN FRENCH),
Montreal Univ. (Quebec). Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.

W73-09702

THE REGULARITIES OF VERTICAL DISTRIBUTION OF BENTHOS IN BOTTOM SEDIMENTS OF THREE MASURIAN LAKES,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
Kajak, Zdzislaw, Dusoge, and Krzysztof.
Ekol Pol. Vol 19, No 32, p 485-499. 1971. Illus. Polish summary.
Identifiers: *Benthos, *Bottom sediments, Chironomidae, Fish, Lakes, *Masurian lakes (Pol.), Sediments, Vertical distribution (Organisms), *Poland.

The majority of benthic organisms occurred in a surface layer of bottom sediments, several centimeters deep which made it easily accessible for benthos feeding fish. The maximal numbers of organisms were usually found in the very surface layers, while the maximal biomass was in slightly deeper layers. Usually 90% of biomass of Chironomidae, or even more was found in the 1st 6 cm layer.--Copyright 1972, Biological Abstracts, Inc.
W73-09750

2I. Water in Plants

FORESTS, WETLANDS AND WATERFOWL POPULATIONS IN THE TURTLE MOUNTAINS OF NORTH DAKOTA AND MANITOBA,
North Dakota State Univ., Fargo.
R. E. Stewart, Jr.
Ph D Thesis, August, 1971. 196 p, 12 fig, 45 tab, 144 ref.

Descriptors: *Ducks (Wild), *Waterfowl, *Canada, *North Dakota, *Ecology, Mallard duck, Ring-necked duck, Pintail duck, Land use, Forests, Grasslands, Habitats, Productivity, Population.
Identifiers: *Turtle Mountains (Alberta-North Dakota).

The Turtle Mountains of Alberta and North Dakota are an aspen island in a sea of prairie. Forests, wetlands and waterfowl of the Turtle Mountains were studied from 1967 through 1970. The orographic effect of the low escarpment is about 10 inches of precipitation. The Manitoba portion is a wilderness, while the North Dakota side is heavily farmed. Class 3 to 5 wetlands (seasonal, semipermanent and permanent) and waterfowl were studied on 80 quarter sections of land, 60 on the U.S. side from 1967-1970, and 20 on the Canadian portion from 1969-1970. Essentially all of the Canadian wetlands are in an agricultural non-use category, while 85% of the U.S. wetland basins are in a category of intensive land use, mostly grazing. Beaver activity was much higher on the Canadian side. Mallards and canvasback began nesting in April, but broods of blue-winged teal and ring-necked ducks hatched as late as the third week of August. Breeding pair densities were highest the spring of the drought, probable due to drought conditions in the surrounding arid prairie, and lowest the year after the drought. Breeding success, numbers of broods, production, and population replacement were low the year of the drought and high 2 years later after a season of more average precipitation. The Canadian side consistently produced 40% more broods than the U.S. portion. On the average the U.S. side produced 95 pounds of young duck per section, while the Canadian portion produced 185 pounds. (Knapp-USGS)
W73-09136

WATER SOURCES FOR HOUSE MICE LIVING IN SALT MARSHES,
California State Univ., Humboldt, Arcata. Dept. of Biology.
J. R. Greene, and D. S. Fertig.
Physiol Zool. Vol 45, No 2, p 125-129. 1972. Illus.
Identifiers: Animals, Marshes, *Mice, Musmusculus, *Salt marshes, Water sources.

An attempt was made to determine the natural water sources of feral house mice, Mus musculus Linnaeus 1758, from salt marshes of southern California by comparing the urine concentrations of field-collected samples with those obtained in a previous laboratory study. Two mice in the field had high urine chloride concentrations (620 and 895 mEq Cl/l) similar to those produced by feral mice drinking seawater in the laboratory. All 11 field samples had low urine osmotic concentrations (1580 to 2820 milliosmolals/kg) similar to those from feral mice drinking water ad lib in the laboratory. Plant and animal matter, dew, and seawater serve as possible sources of water. It appears that feral mice are not stressed routinely for water in salt marshes, even during seasonal periods of aridity.--Copyright 1973, Biological Abstracts, Inc.
W73-09194

SPECIES DIVERSITY OF STREAM INSECTS ON FONTINALIS SPP. COMPARED TO DIVERSITY ON ARTIFICIAL SUBSTRATES,
Plymouth State Coll, N. H. Dept. of Natural Sciences.
J. M. Glime, and R. M. Clemons.
Ecology. Vol 53, No 3, p 458-464. 1972. Illus.
Identifiers: Fontinalis-Spp, *Insects (Stream), *Species diversity, Streams, Substrates, *Mosses (Artificial).

Two types of artificial mosses (string and plastic) were compared with Fontinalis spp. for their insect inhabitants. These communities were sampled on 6 dates at 8 stream sites and compared by community coefficients, information theory analysis, and rank correlations. These results showed that those insects which were abundant on moss were also abundant on the artificial substrates. Fewer species and fewer individuals were present on the latter.--Copyright 1973, Biological Abstracts, Inc.
W73-09414

DOWNSTREAM MOVEMENTS OF WHITE SUCKER, CATASTOMUS COMMERSONI, FRY IN A BROWN-WATER STREAM OF ALBERTA,
Alberta Univ., Edmonton. Dept. of Zoology.
H. F. Clifford.
J Fish Res Board Can. Vol 29, No 7, p 1091-1093. 1972. Illus.
Identifiers: Biomass, *Brown water streams, *Canada (Alberta), Catostomus-Commersoni, Fry, Streams, *Sucker (White).

In a brown-water stream of Alberta, C. commersonii fry moved downstream almost entirely at night. During June and July when the fry were moving downstream, their nocturnal 'drift' pattern was more pronounced than that of any of the drifting invertebrates; and at this time their total biomass crossing a width transect per 24 hr exceeded the combined total biomass of the drifting invertebrate taxa. As the fry became larger, many more moved downstream near the surface of the water than near the stream's substrate.--Copyright 1973, Biological Abstracts, Inc.
W73-09426

THE RESPONSE OF CYANOGENIC AND ACYANOGENIC PHENOTYPES OF TRIFOLIUM REPENS TO SOIL MOISTURE SUPPLY,
Sheffield Univ. (England). Dept. of Botany.
W. Foulds, and J. P. Grime.
Heredity. Vol 28, No 2, p 181-187. 1972. Illus.
Identifiers: Acyanogenic, Cyanogenic, *Soil moisture, Phenotypes, *Trifolium repens.

Under experimental conditions of severe drought, fatalities in Ac phenotypes of T. repens exceeded those in ac phenotypes by a factor of 3. Under sublethal moisture stresses the yields of Ac and ac phenotypes were not significantly different. In moist conditions ac phenotypes attained higher yields than the Ac plants suggesting a possible linkage between the Ac gene and genes affecting vegetative vigor. Cyanogenic plants displayed a low sexual reporductive vigor in all treatments. Moisture stress inhibited flowering completely under conditions in which flowers were produced in all 3 acyanogenic phenotypes.--Copyright 1973, Biological Abstracts, Inc.
W73-09428

OSCILLATIONS IN STOMATAL CONDUCTANCE AND PLANT FUNCTIONING ASSOCIATED WITH STOMATAL CONDUCTANCE: OBSERVATIONS AND A MODEL,
Australian National Univ., Canberra. Dept. of Environmental Biology.
I. R. Cowan.
Planta (Berl). Vol 106, No 3, p 185-219. 1972.
Identifiers: *Plant physiology, Capacitors, Circadian rhythm, *Stumatal conductance, *Cotton, Illumination, Models, Oscillations, Permeability, Plants, Transpiration.

Measurements of transpiration, leaf water content, and flux of water in a cotton plant exhibiting sustained oscillations in stomatal conductance were presented, and a model of the mechanism causing this behavior was developed. The dynamic element of the model was capacitors--representing the change of water content with water potential in mesophyll, subsidiary and guard cells--interconnected by resistances representing flow paths in the plant. Increase of water potential in guard cells caused an increase in stomatal conductance. Increase of water potential in the subsidiary cells had the opposite effect and provided the positive feed-back which caused stomatal conductance to oscillate. The oscillations were shown to have many of the characteristics of free-running oscillations in real plants. The behavior of the model was examined, using an analogue computer, with constraints and perturbations representing some of those which could be applied to real plants in physiological experiments. Aspects of behavior which were simulated are opening and closing of stomata under the influence of changes in illumination, transient responses due to step changes in potential transpiration, root permeability and potential of water surrounding the roots, the influence of these factors on the occurrence and shape of spontaneous oscillations, and modulation of sustained oscillations due to a circadian rhythm in the permeability of roots.--Copyright 1973, Biological Abstracts, Inc.
W73-09429

CLASSIFICATION AND EVALUATION OF FRESHWATER WETLANDS AS WILDLIFE HABITAT IN THE GLACIATED NORTHEAST,
Massachusetts Univ., Amherst. Dept. of Biology.
F. C. Golet.
Ph D Thesis, October 1972. 179 p, 15 fig, 27 plate, 3 tab, 112 ref. OWRR B-012-Mass (3) and B-023-Mass (3).

Descriptors: *Wetlands, *Wildlife, *Freshwater marshes, *Classification, *Northeast U.S., Data collections, Massachusetts, Publications, Reviews, Marshes, Swamps, Vegetation, Bodies of water, Aquatic environment, Shallow water, Bogs, Water chemistry, Aquatic plants, Aquatic animals.

During the summer of 1970, qualitative data on habitat were collected at over 100 wetlands located throughout Massachusetts. Thirty-eight wetlands of high value to wildlife were selected for study during the fall of 1971. An extensive literature review of the habitat requirements of wetland wildlife species supplemented data gathered in the field. This dissertation presents the findings in two parts. Part I describes a detailed classification system for freshwater wetlands in the glaciated Northeast. Wetland vegetation is classified into

five life forms and 18 subforms. Other components of the classification system include: 5 size categories, 6 site types, 8 cover types, 3 vegetative interspersion types, and 6 surrounding habitat types. Methods and general considerations for application of the system are outlined also. Part II presents a list of 10 criteria for evaluating wetlands as wildlife habitat. These criteria are based largely upon the classification system in order of most to least important: (1) wetland class richness, (2) dominant wetland class, (3) size category, (4) subclass richness, (5) site type, (6) surrounding habitat type (s), (7) cover type, (8) vegetative interspersion type, (9) wetland juxtaposition, and (10) water chemistry. (Woodard-USGS)
W73-09430

AVAILABILITY OF MANGANESE AND IRON TO PLANTS AND ANIMALS,
West Virginia Univ., Morgantown. Dept. of Animal Industries and Veterinary Science.
For primary bibliographic entry see Field 02K.
W73-09474

ECOLOGY OF CORTICOLOUS LICHENS: III. A SIMULATION MODEL OF PRODUCTIVITY AS A FUNCTION OF LIGHT INTENSITY AND WATER AVAILABILITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
G. P. Harris.
J Ecol. Vol 60, No 1, p 19-40, 1972. Illus.
Identifiers: Canopy, Carbon, *Corticolouslichens, Ecology, Evaporation, *Lichens productivity, Light intensity, Oak-D, Parmelia-Caperata, Productivity, Rainfall, Simulation models, Through-Fall, Trees.

A mathematical simulation model for predicting epiphytic corticolous lichen productivity was built relating lichen productivity to environmental conditions at Shaugh, S. Devon, (England). Net C assimilation rates were calculated for Parmelia caperata (L) Ach. at 6 heights in a model oak tree, for a simulated time period of 2 yr. Weekly totals of net C assimilation were calculated for lichens at each height. The model has been constructed as a series of blocks each of which relates to, and was tested against, observed field data. It included a main program-responsible for setting up arrays, reading data, and calling sub-routines, and a radiation intensity sub-routine-using input parameters of time of year, time of day, cloud cover, and radiation drop inside the tree canopy; radiation levels were calculated for each of the 6 height zones in the tree. A wetting-up sub-routine used rates of wetting of different parts of the tree during rain, observed in the field using paper-grid conductivity sensors and a portable 12-track chart recorder. A new technique for modeling rainfall/throughfall was used to simulate the wetting-up system and was tested against observed data, with good agreement. Measurements of evaporation were carried out in the field using the paper-grid conductivity sensors and small capillary evaporimeters. Calculations of evaporation by Penman's method were used to estimate evaporation rates from the entire tree canopy. Various methods of apportioning the evaporation rates within the canopy are discussed. Calculations of thallus physiology are based on data published in a previous paper in this series. The model appears to give a calculated result which compares favorably with the vertical distribution of P. caperata measured in the field. Variation in weekly net C assimilation totals are shown to be highly variable and are thought to be correlated with water availability in the environment. Changes in the vertical evaporation gradient are shown to have a strong effect on the vertical distribution of this species.--Copyright 1972, Biological Abstracts, Inc.
W73-09512

THE BOTTOM FAUNA OF THE SUCHA WODA STREAM (HIGH TATRA MTS) AND ITS ANNUAL CYCLE,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
M. Kownacka.
Acta Hydrobiol. Vol 13, No 4, p 415-438, 1971. (Polish summary).
Identifiers: *Annual cycles, Baetis-Alpinus, *Bottom fauna, *Insects, Caddisflies, Diamesa-Latitarsis, Eukiefferiella, Fauna, Mountains, Orthocladius-Rivicola, Orthocladius-Thienemanni, Parorthocladius-Nudipennis, *Poland, Rhitrogena-Loyolaea, Stone-Flies, Streams, Sucha Woda (Pol).

The bottom fauna in the stream Sucha Woda was chiefly represented by larvae of insects, especially of flies (dominant Chironomidae), mayflies, stoneflies, and caddisflies. The distribution of these groups showed a distinct 'etagement,' as well as quantitative and qualitative differences according to the height and the velocity of the current. Above 1550 m the fauna was poor both qualitatively and quantitatively. The dominant forms were Diamesa gr. latitarsis. One quantitative peak was observed in Sept., brought about chiefly by D. gr. latitarsis and by some stoneflies, and Simuliidae. At altitude 1550-1000 m the number of species and individuals greatly increased in the stream. Eukiefferiella minor and Parorthocladius nudipennis, as well as Baetis alpinus and Rhitrogena loyolaea predominated. A thrice repeated increase in fauna was noted in winter (the greatest), in spring, and summer. Below 1000 m a number of species characteristic of rivers with a small gradient and a higher content of Ca appeared in the stream. A large number of individuals were noted. The dominant forms were Orthocladius rivicola and O. thienemanni. The fauna increased 3 or 4 times in number. The smallest number of individuals was noted in winter and the greatest in summer.--Copyright 1972, Biological Abstracts, Inc.
W73-09517

PENETRATION OF STOMATA BY LIQUIDS: DEPENDENCE ON SURFACE TENSION, WETTABILITY, AND STOMATAL MORPHOLOGY,
Michigan State Univ., East Lansing. Dept. of Horticulture.
J. Schoenherr, and M. J. Bukovac.
Plant Physiol. Vol 49, No 5, p 813-819. 1972. Illus.
Identifiers: Cuticular ledges, *Leaf surfaces, Liquids, Morphology, *Stomata, Stomatal, *Surface tension, Vestibule, *Wettability, Zebrina-purpusii-m.

Wettability of the leaf surface, surface tension of the liquid, and stomatal morphology control penetration of stomata by liquids. The critical surface tension of the lower leaf surface of Zebrina purpusii Bruckn. was estimated to be 25-30 dyne cm -1. Liquids having a surface tension less than 30 dyne cm -1 gave zero contact angle on the leaf surface and infiltrated stomata spontaneously while liquids having a surface tension greater than 30 dyne cm -1 did not wet the leaf surface and failed to infiltrate stomata. Considering stomata as conical capillaries, it was possible to show that with liquids giving a finite contact angle, infiltration depended solely on the relationship between the magnitude of the contact angle and the wall angle of the aperture. Generally, spontaneous infiltration of stomata will take place when the contact angle is smaller than the wall angle of the aperture wall. The degree of stomatal opening (4, 6, 8, or 10 micro m) was of little importance. Cuticular ledges present at the entrance to the outer vestibule and between the inner vestibule and substomatal chamber resulted in very small if not zero wall angles, and thus played a major role in excluding water from the intercellular space of leaves. It is shown why the degree of stomatal opening cannot be assessed by observing spontaneous infiltration of stomata by organic liquids of low surface tension.--Copyright, 1972, Biological Abstracts, Inc.
W73-09531

PATHOGENICITY OF PYRICULARIA AND COCHLIO-BOLUS CONIDIA COMPRESSED BY HYDROSTATIC PRESSURE (EFFECT OF PHYSICAL FACTORS UPON PLANT DISEASES: V.). (IN JAPANESE),
Gifu Univ. (Japan). Faculty of Agriculture.
H. Ikegami, and I. Takagi.
Ann Phytopathol Soc Jap. Vol 38, No 2, p 95-99. 1972. Illus. English summary.
Identifiers: Cochliobolus-miyabeanus, *Conidia, Germination, *Hydrostatic pressure, *Pathogenicity, Piricularia-Oryzae, Plant diseases, *Rice-M.

When conidia of Pyricularia oryzae were compressed at 0, 500, 1000, 1500, and 1800 kg/cm2 for 10 min., germination was reduced from 97% to 16%. The infectivity of these conidia to rice leaves was correspondingly reduced. At 0-1000 kg/cm2 the number of conidia with appressoria exceeded those with ordinary germ tubes, whereas at 1500 and 1800 kg/cm2 conidia with appressoria were less than those with germ tubes. With increasing pressures (0-1800 kg/cm2) the number of susceptible type lesions decreased 7.5-0.5/10 cm of rice leaf, whereas the number of resistant type lesions remained approximately constant at 1/10 cm. When conidia of Cochliobolus miyabeanus were exposed to increasing pressures, the germination and infection were reduced, but not as much as with p. oryzae. Conidia exposed to pressures above 1500 kg/cm2 formed smaller lesions on rice leaves than those exposed to lower pressures.--Copyright 1972, Biological Abstracts, Inc.
W73-09536

THE INTERNAL WATER STATUS OF THE TEA PLANT (CAMELLIA SINENSIS): SOME RESULTS ILLUSTRATING THE USE OF THE PRESSURE CHAMBER TECHNIQUE,
Tea Research Inst. of East Africa, Kericho (Kenya).
For primary bibliographic entry see Field 03F.
W73-09541

EFFECTS OF WATER DEFICITS ON FIRST PERIDERM AND XYLEM DEVELOPMENT IN FRAXINUS PENNSYLVANICA,
Wisconsin Univ., Madison. Dept of Forestry.
G. A. Borger, and T. T. Kozlowski.
Can J For Res. Vol 2 No 2, p 144-151, 1972. Illus.
Identifiers: Desiccation, Ethylene, *Fraxinus-Pennsylvanica-D, Glycol, *Periderm, Physiological studies, Seed, Water deficit, *Xylem.

Three-day-old seedlings of F. pennsylvanica were transferred to soil undergoing periodic drying or continuous subirrigation. Seedlings were harvested after 24 days. Germinating seeds of F. pennsylvanica were exposed to 1, 10, 20, or 30% polyethylene glycol (PEG) for 35 days and 1-day-old seedlings were exposed to 1, 10, or 20% PEG for 35 days. Seedlings grown on drying cycles or in 20% PEG had smaller periderm and xylem increments than seedlings grown in continuously subirrigated soil or 1 or 10% PEG, respectively. Xylem increment was affected more than periderm increment by water deficits. Germinating seeds exposed to 10 or 20% PEG did not develop periderm or secondary xylem and did not expand foilage. Thirty percent PEG caused desiccation and death or germinating seeds. Seeds exposed to 1% PEG germinated and developed normally. When water deficits occurred during germination the foilage failed to expand and periderm formation was thereby prevented. Water deficits subsequent to seed germination reduced periderm increment less than they reduced xylem increment, indicating difference in physiological controls.--Copyright 1972, Biological Abstracts, Inc.

W73-09542

ECOLOGY. THE EXPERIMENTAL ANALYSIS OF DISTRIBUTION AND ABUNDANCE,
For primary bibliographic entry see Field 06G.
W73-09547

COMMON MARSH, UNDERWATER AND FLOATING-LEAVED PLANTS OF THE UNITED STATES AND CANADA,
N. Hotchkiss.
Dover Publication, Inc.: New York, N.Y., 1972, 124p. Illus. Paper Pr. $3.00.
Identifiers: Azolla-P, Book, Bulrushes-M, *Canada, Dicots, Distribution, *Floating-leaved plants, Flowers, Identification, Isoetes-P, Marsh plants, *United States, Nitella, Seeds, Spikelets, *Underwater plants.

This is the 4th of a series of publications on field identification of North American marsh and water plants. It describes the emergent and semi-emergent plants (mostly Monocotyledones but, including many Dicotyledones, Azolla, Isoetes, and Nitella) most likely to be found in inland and coastal marshes. The present publication widens the scope of 'Bulrushes and Bulrushlike Plants of Eastern North America' and contains most of the species listed therein. This guide is designed for identification of marsh plants without recourse to technical botanical keys. The plants are presented in 7 different descriptive groups. Identification is made by finding the group in which the plant fits, then locating a drawing and description that matches the plant in question. Each description is headed by both a common and a scientific name. At least 1 drawing at life, 1/2, 1/4 or 1/16 size is given for each plant; most plants are illustrated by 3 separate drawings showing full view, seed podsor flowers and other distinguishing marks. Also included in the description are synonyms, habitat, distribution, size and identifying characteristics such as stem, leaves, seeds, scales, spikelets, flowers and growing pattern for each species with resemblances between species clarified.--Copyright 1972, Biological Abstracts, Inc.
W73-09548

PERIODICAL FLUCTUATIONS OF THE MOISTURE CONTENT OF PRINCIPAL SPECIES COMPOSING THE HERBACEOUS LAYER AND MASS STRATA DURING 1969 (IN FRENCH),
Brussels Univ. (Belgium). Laboratoire de Botanique Systematique et d'Ecologie.
G. Schnock.
Bull Soc R Bot Belg, Vol 105, No 1, p 129-141, 1972, Illus, English summary.
Identifiers: Carex-digitata-M, Evapotranspiration, Fagus-sylvatica-D, Foliar, Fragaria-vesca-D, Hedera-helix-D, *Herbaceous layer, Lamium-galeobdolon-D, Mercurialis-perennis-D, *Moisture content, Moss, Narcissus-pseudonarcissus-M, Oak-D, Phenology, Primula-veris-D, Principal, Scilla-bifolia-M, Transpiration, Viola-reichenbachiana-D.

Investigations of twelve species from the herbaceous layer of a mixed oak forest show that their water content varied from 100 to 1100% during the year 1969. For Scilla bifolia and Narcissus pseudonarcissus, variation in water content extends from 550-1100%, for Lamium galeobdolon, Viola reichenbachiana, Fragaria vesca and Carex digitata from 150 to 700%, and for Hedera helix, from 100 to 300%. Highest values are observed during the flowering time in S. bifolia, N. pseudonarcissus, Primula veris and L. galeobdolon, during the foliar infolding for Mercurialis perennis and Fagus sylvatica (cotyledonal leaves) and during the fruiting period for F. vesca, and V. reichenbachiana. For the species with vegetative reproduction (F. vesca, L. galeobdolon and C. digitata), the water content reaches high percentages during this whole period. The moisture percentage of the moss layer (internal plus external water) depends more on the rainfall distribution than on the phenology of the species: 60% in dry period and 470% after rainy weather. The mean water content of the ground flora is lower than 1 mm, and shows considerable variations which reach 50% (0.4 mm) of the mean value. These variations are due to extreme values observed i January 1972 to discuss public rights and private use of beaches along the Texas coast. This report summarizes Texas law of the beaches and reports by participants which suggested necessary amendments to the Open Beaches Act (Act) to make it more protective of the public rights. Although the conference was not aimed at reaching any specific conclusions, the discussions did point out that the Texas Open Beaches Act may not guarantee the public a right to use all beaches; but, where such rights exist, state and local regulations are desirable to assure orderly development of public use. The Open Beaches Act was enacted to reduce to statutory language some common law concepts that recognize certain public rights to use the beaches. The act directs the Attorney General to protect the people's right, defined as a right of ingress and egress to that portion of the beach owned by the state and also to that part of the beach impressed with a presumption of a right of use by the people. Moreover, the Act provides for a presumption of prescriptive right to the area between low tide and, generally, the vegetation mark. There is also a discussion of the proposed National Open Beaches Act and actions taken by other coastal states. (Mockler-Florida)
W73-09679

ON NEONEMURA ILLIESI NOV. SPEC. AND SOME OTHER STONEFLIES FROM CHILE (INS., PLECOPTERA),
Max-Planck-Institut fuer Limnologie, Schlitz (West Germany). Limnologische Flussstation.
P. Zwick.
Stud Neotrop Fauna, Vol 7, No 1, p 95-100. 1972. Illus.
Identifiers: Araucanioperla, C, *Chile, Insects, Larval, *Neonemura-illiesi, Plecoptera, *Stoneflies.

Neoneumura illiesi is described from Chile, together with larval type C of Araucanioperla (.), found under stones in a small stream. Notes are also given on 6 other species of stoneflies from Chile.--Copyright 1972, Biological Abstracts, Inc.
W73-09680

THE MER BLEUE SPHAGNUM BOG NEAR OTTAWA: II. SOME ECOLOGICAL FACTORS, (IN FRENCH),
Montreal Univ. (Quebec). Dept. of Biological Sciences.
R. Joyal.
Can J Bot. Vol 50, No 6, p 1209-1218, 1972. Illus. English summary.
Identifiers: *Bogs, Climate, *Ecological studies, Humidity, Mer-bleue, Moss, Ombro, Peat, Picea-mariana-G, Polytrichum, Sphagnum bogs, Spruce-G, Temperature, Tropic level, *Canada (Ottawa).

Mer Bleue is an ombrotrophic Sphagnum and black spruce (Picea mariana) bog near Ottawa, Ontario. Its 5000 acres offer a vegetation composed of 10 associations and 3 sub-associations. Day temperature in the bog is 2.7F higher and night temperature 3.2F lower than at Uplands Airport 7 mi away. Relative humidity is also higher. The black spruce stand is the most humid and the coolest of all plant associations and its water table is the highest, while the Polytrichum association is the dryest and the warmest. Black spruce stands also have the most stable climate. Temperature at 1 ft depth in the peat moss reaches a minimum of 55F in summer. At 2 ft depth a maximum of 47C occurs in Sept. and a minimum of 24F in Feb.--Copyright 1972, Biological Abstracts, Inc.
W73-09702

THE OCCURRENCE, LIFE CYCLE, AND PATHOGENICITY OF ECHINURIA UNCINATA (RUDOLPHI, 1819) SOLOVIEV, 1912 (SPIRURIDA', NEMAT ODA) IN WATER FOWL AT DELTA, MANITOBA,
Naval Medical Research Inst., Bethesda, Md.
F. G. Austin, and H. E. Welch.
Can J Zool. Vol 50, No 4, p 385-393. 1972. Illus.
Identifiers: *Parasites (Waterfowl), Canada (Manitoba), Ceriodaphnia species, Chirocephalopsis-bundyi, *Daphnia-magna, *Deltas, *Duck, *Echinuria-uncinata, Eurycercus-lamellatus, Gammarus-lacustris, Geese, Hyallela-azteca, Lynceus-brachyurus, Mallard, Moina-macrocopa, *Nematoda, Pathogenicity, Simocephalus-vetulus.

In the Delta Marsh, third-stage E. uncinata juveniles were found in Daphnia magna, D. pulex, Simocephalus vetulus, and Gammarus lacustris. D. magna, the major host, were infected from late May to early Nov. with a peak of 108 parasites/100 Daphnia in early August. Experimentally, D. magna, D. pulex, Ceriodaphnia reticulata, C. acanthina, S. vetulus, Moina macrocopa, Eurycercus lamellatus, G. lacustris, Hyallela azteca, Chirocephalopsis bundyi, and Lynceus brachyurus became infected when exposed to E. uncinata eggs. Parasites developed to the infective stage in D. magna and D. pulex in 30 days at 15 C and in 10 days at 20-24 C. In mallard ducks, E. uncinata completed the fourth molt 20 days after infection; male worms were sexually mature after 30 days and females oviposited 40 days after infection. Parasites grew faster in 1 wk-old Delta mallards than in 2 and 3 mo.-old birds. Adult nematodes were located beneath the mucosal layer at the junction of the proventriculus and gizzard where granulomas formed after 30 days. The number of granulomas was correlated with the number of parasites. Mallards, pintails, gadwalls, lesser scaup, common eiders, and domestic geese were more susceptible to Echinuria infection than were shovellers, blue-winged teal, redheads, ruddy ducks, and American coots. Parasite eggs died when frozen but 50% survived 85 days when dried on filter paper. Echinuria uncinata can survive winter in resident mallards.--Copyright 1972, Biological Abstracts, Inc.
W73-09749

2J. Erosion and Sedimentation

EFFECTS OF RIVER CURVATURE ON A RESISTANCE TO FLOW AND SEDIMENT DISCHARGES OF ALLUVIAL STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 02E.
W73-09102

RATES OF HILLSLOPE LOWERING IN THE BADLANDS OF NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
L. Clayton, and J. R. Tinker, Jr.
North Dakota University Water Resources Research Institute Brookings Report WI-221-012-71, December, 1971. 36 p, 20 fig, 9 tab, 21 ref.

Descriptors: *Erosion, *Slopes, *Sediment transport, *Sediment yield, *North Dakota, Small watersheds, Valleys, Topography, Geomorphology, Hydrology, Runoff, Sedimentation.
Identifiers: *Badlands (N DAK), Buttes, Slopewash.

Measurements in a small drainage basin in the Little Missouri Badlands of western North Dakota indicate an average rate of hillslope lowering by slopewash of 0.41 inch per year on the west-facing hillslopes underlain by the Sentinel Butte Formation, 0.14 inch per year on the southwest-facing hillslopes underlain by the Tongue River Formation, and 0.11 inch per year on the northeast-facing hillslopes underlain by the Tongue River Forma-

tion. Soil creep occurs mainly on the Tongue River Formation and is mostly restricted to the northeast-facing hillslopes where the average rate of soil creep parallel to the hillslope surface is 0.23 inch per year in the upper 2.5 inches of surficial sediment. Erosion perpendicular to the face of seepage steps is 0.29 inch per year. The Sentinel Butte Formation has a lower rate of infiltration and percolation, which results in a higher rate of surface runoff than on the Tongue River Formation. The lowering of the hillslopes by slopewash contributes 99.9% of the 43,000 cubic feet of sediment per year from the hillslopes in the study areas. Comparison of the hillslope sediment yield with the rates of valley-bottom deposition from June to July, 1969, indicated that approximately 62% of the hillslope sediment left the drainage basin. (Woodard-USGS)
W73-09121

OBSIDIAN HYDRATION DATES GLACIAL LOADING,
Geological Survey, Denver, Colo.
I. Friedman, K. L. Pierce, J. D. Obradovich, and W. D. Long.
Science, Vol 180, No 4087, p 733-734, May 18, 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Hydration, *Dating, *Glaciation, *Weathering, Pleistocene epoch, Lava, Igneous rocks, Rhyolites.
Identifiers: *Obsidian.

The thickness of hydration rinds on the surface of obsidian (volcanic glass of rhyolitic composition) increases with age and is used for dating obsidian artifacts that were manufactured 200 to 250,00 years ago. Hydration rinds are also used to measure the age of rhyolite volcanic flows. In an attempt to relate hydration thicknesses on a rhyolite flow containing obsidian to the age of the flow as determined by the K-Ar method obsidian was collected in a small cavelike structure in the face of Obsidian Cliff, Yellowstone National Park, Wyoming, about 30 m below the flow surface. The average thickness of the thickest (oldest) group of hydration rinds is 16.3 micrometers and can be related to the original emplacement of the flow 176,000 years ago. In addition to these original surfaces, most thin sections show cracks and surfaces which have average hydration rind thicknesses of 14.5 and 7.9 micrometers. These later two hydration rinds compare closely in thickness with those on obsidian pebbles in the Bull Lake and Pinedale terminal moraines in the west Yellowstone basin, which are 14 to 15 and 7 to 8 micrometers thick, respectively. The later cracks are thought to have been formed by glacial loading during the Bull Lake and Pinedale glaciations, when as estimated 800 meters of ice covered the Obsidian Cliff flow. (Knapp-USGS)
W73-09125

SEDIMENTATION AND PHYSICAL LIMNOLOGY IN PROGLACIAL MALASPINA LAKE, ALASKA,
Massachusetts Univ., Amherst. Coastal Research Center.
T. C. Gustavson.
Available from NTIS, Springfield, Va. 22151 as AD-750 782, Price $3.00 printed copy; $0.95 microfiche. Technical Report No 5-CRC, August 1972. 48 p, 16 fig, 3 tab, 16 ref. Contract No N00014-67-A-0230-0001.

Descriptors: *Sedimentation, *Lakes, *Limnology, *Glacial sediments, *Alaska, Data collections, Glaciology, Lake morphology, Lake sediments, Varves, Streamflow, Melt water, Inflow, Discharge (Water), Density currents, Turbidity currents, Glaciohydrology.
Identifiers: *Proglacial lake, *Malaspina Lake (Alaska), Glaciolacustrine sediements.

Glaciolacustrine varved sediments are presently being deposited in Malaspina Lake, which lies along the southeastern margin of the Malaspina Glacier in Alaska. Malaspina Lake water exhibit a reserve thermal stratification. Water near the temperature of maximum density (3.94 deg C) occurs close to the lake surface, while water as cold as 0.3 deg C occurs at the lake bottom. The lake is normally stratified, however, with respect to suspended sediment content, which ranges from 0.1 g/liter at the surface to 0.7 g/liter at a depth of 45 m. Two large surface streams, Russell Stream and Tarr Stream, flow into the lake and their combined discharge is 140 cm. Discharge from the lake is as much as 600 cm. thus subglacial and englacial streams apparently discharge as much as 460 cm into the lake. Bottom topography of the lake is quite irregular except where the selective infilling of basins by turbidity currents has produced flat to gently sloping topography. Cores taken of these flat areas contain varved sediments. Varves, deposited at depths of 50 m or more, contain normal and reverse graded beds and horizontal beds. The current-bedded portion of the varve was deposited from an underflow or turbidity current. (Woodard-USGS)
W73-09141

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT.
Delaware Univ., Newark.
For primary bibliographic entry see Field 02L.
W73-09144

QUANTITATIVE ESTIMATES OF MUDFLOW HAZARD (O KOLICHESTVENNOY OTSENKE SELEOPASNOSTI),
Moscow State Univ. (USSR). Problemnaya Laboratoriya Nezhnykh Lavin i Selei.
S. M. Fleyshman.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 4, p 26-31, 1972. 1 tab.

Descriptors: *Erosion, *Mass wasting, *Mudflows, Estimating, Evaluation, Mountains, Valleys, Slopes, Basins, Priorities.
Identifiers: *USSR, *Mudflow hazard.

A quantitative criterion for mudflow-hazard evaluation in mountainous areas is based on the relation between frequency of mudflow occurrence (mudflow activity) and volume of material transported by a mudflow during mass movement. Problems are considered which relate mudflow danger to the order of urgency of remedial measures for its prevention and control in the national economy. (Josefson-USGS)
W73-09150

SUSPENDED SEDIMENT DISCHARGE IN WESTERN WATERSHEDS OF ISRAEL,
Hebrew Univ., Jerusalem (Israel). Dept of Geography.
M. Negev.
Israel Hydrological Service Hydrological Paper No 14, 1972. 73 p, 15 fig, 9 tab, 6 ref, 3 append.

Descriptors: *Sediment transport, *Streamflow, *Suspended load, *Sediment yield, Forecasting, Methodology, Regression analysis, Floods, Equations, Hydrologic data, Foreign countries, Runoff, Correlation analysis, Evaluation.
Identifiers: *Israel.

Suspended sediment data were collected during a 3-year period on several streams in Israel. Two methods of analysis were used; one was a regression of sediment discharge on water discharge and other variables, and the other was a regression of sediment loads transported by single floods on flood volumes and other variables. In the first method, prediction equations were formulated based on the first year of data and then examined for competence with data for the last 2 years. This analysis reveals stable relationships in four of the streams, and suggests curtailing costly sediment sampling activities in these streams. The second method provides a simple and convenient tool for predicting sediment loads; however, there is less precision than with the first method. (Woodard-USGS)
W73-09163

CLAY MOBILITY IN RIDGE ROUTE LANDSLIDES, CASTAIC, CALIFORNIA,
Stanford Univ., Palo Alto, Calif.
P. F. Kerr, and I. M. Drew.
The American Association of Petroleum Geologists Bulletin, Vol 56, No 11 (Part I and II), p 2168-2184, November 1972. 17 fig, 6 tab, 14 ref.

Descriptors: *Landslides, *Clay, *California, *Embankments, Mass wasting, Clay minerals, Slopes, Stratigraphy.
Identifiers: *Castaic (Calif).

Landslides along clay-bearing bedding planes in road cuts along Interstate 5, where it crosses the western extension of the San Gabriel Mountains in southern California between Castaic and Gorman, occur where the strike of the clay-bearing strata in road cuts is parallel with the highway, and the dip is toward the roadway at an angle less than the slope of the cut. Slides also occur on dip slopes. Montmorillonite and illite are abundant minerals in the clay-bearing strata. When the water content of the clay that contains these minerals exceeds 505, the cone shear resistance drops to 0.001 to 0.1 tsf, whereas at 20%-35% water content, the shear remains in excess of 1.0 tsf. A large highway fill across West Liebre Gulch slid badly. South of the gulch, strata strike approximately normal to the line of the freeway and dip north toward the bottom of the gulch. Clay-bearing zones lie just beneath the surface. An old landslide, formed long before construction was contemplated, extended across the line chosen for the freeway. Fill, emplaced when the freeway was consructed, slid when the old slide, partly buried beneath the fill, was reactivated following heavy rains both in 1967 and 1969. (Knapp-USGS)
W73-09164

DEEP SEA SEDIMENTS AND THEIR SEDIMENTATION, GULF OF MEXICO,
Missouri Univ., Columbia. Dept. of Geology.
D. K. Davies.
The American Association of Petroleum Geologists Bulletin, Vol 56, No 11, p 2212-2239, November 1972. 34 fig, 2 tab, 31 ref. USGS 14-08-0001-11990; ONR N0014-038 (0002).

Descriptors: *Bottom sediments, *Gulf of Mexico, *Turbidity currents, *Sedimentation, *Provenance, Mississippi River, Stratigraphy, Sedimentology, Distribution patterns, Sediment distribution, Sediment transport.
Identifiers: *Deep-sea sediments.

Five distinct sources have contributed terrigenous sediment to the Gulf of Mexico during the Quaternary: (1) the Apalachicola, (2) the Mississippi, (3) the central Texas Rivers, (4) the Rio Grande, and (5) the rivers of northeast Mexico. Sands and silts originating from the Mississippi, Rio Grande, and northeast Mexico are mapped from the continental shelf to the abyssal plain. Sediments from the other sources are so adulterated by adjacent inputs as to be unrecognizable, or remained on the shelf and slope. The provinces of the Campeche shelf and the Florida shelf contributed carbonates. Differential pelagic settling is responsible for the deposition of much of the clay-size sediments. Settling has produced parallel lamination and parallel bedding. Turbidity currents are the most important mechanism for the transport of sands and silts. The most significant sources of abyssal turbidites were the Mississippi River and Campeche shelf. Bottom currents have had little effect on the sands

and silts of the deep gulf. The bottom currents are sporadic, lowsflow phenomena, local, and of short duration. (Knapp-USGS)
W73-09165

HYDROLOGY AND EFFECTS OF CONSERVATION STRUCTURES, WILLOW CREEK BASIN, VALLEY COUNTY, MONTANA, 1954-68,
Geological Survey Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-09167

THE ROLE OF SEDIMENTATION IN THE PURIFICATION OF RESIDUAL WATER, (NOTE SUR LA ROLE DE LA SEDIMENTATION DANS L'EPURATION DES EAUX RESIDUAIRES),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 05G.
W73-09205

SEDIMENT, FISH, AND FISH HABITAT,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05C.
W73-09213

RUNOFF AND SOIL LOSSES ON HAGERSTOWN SILTY CLAY LOAM: EFFECT OF HERBICIDE TREATMENT,
Pennsylvania State Univ., University Park.
J. K. Hall, and M. Pawlis.
Journal of Soil and Water Conservation, Vol 28, No 2, p 73-76, March-April 1973. 3 fig, 1 tab, 2 ref.

Descriptors: *Water yield, *Sediment yield, *Runoff, *Soil erosion, *Herbicides, Erosion, Path of pollutants, Soil conservation.
Identifiers: *Atrazine.

Runoff, sediment losses, and entrained herbicide residues were measured in field plots during the first two years of a corn-corn-oats rotation. The plots, situated on Hagerstown silty clay loam (14% slope), were treated in 1967 with atrazine at 0.5, 1, 2, 4, 6, and 8 pounds per acre. Although chemical losses in runoff and soil sediments were minor, the magnitude of soil and water losses, which increased generally with the rate of herbicide application, suggests the need for continued and expanded use of adequate agronomic and conservation systems and management practices. (Knapp-USGS)
W73-09279

HYDRAULIC EQUIVALENT SEDIMENT ANALYZER (HESA),
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 07B.
W73-09282

VOLUME WEIGHT OF RESERVOIR SEDIMENT IN FORESTED AREAS,
Forest Service (USDA), Boise, Idaho. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04D.
W73-09373

EFFECTS OF LOGGING AND LOGGING ROADS ON EROSION AND SEDIMENT DEPOSITION FROM STEEP TERRAIN,
Forest Service (USDA), Boise, Idaho. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04C.
W73-09374

AQUATIC SEDIMENT AND POLLUTION MONITOR,
For primary bibliographic entry see Field 05A.
W73-09390

QUALITY OF STREAM WATERS OF THE WHITE CLOUD PEAKS AREA, IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09435

DEGRADATION OF THE EARTHQUAKE LAKE OUTFLOW CHANNEL, SOUTHWESTERN MONTANA,
Geological Survey, Helena, Mont.
M. V. Johnson, and R. J. Omang.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C253-C256, 1972. 4 fig.

Descriptors: *Degradation (Stream), *Stream erosion, *Montana, *Landslides, Lakes, Erosion, Degradation (Slope).
Identifiers: *Earthquake Lake (Montana), *Madison River (Montana).

The Madison River is cutting though the Madison Slide, which was caused by the Hebgen Lake earthquake of August 17, 1959. Since July 15, 1960, the crest of the outlet channel of Earthquake Lake, on the slide, has been lowered about 4 feet by degradation. The outlet channel has been degraded as much as 19 feet in one short reach. Degradation of the channel was as much as 8.5 feet during the 1971 spring and summer runoff. Vertical and horizontal changes in the channel have been accompanied by sloughing of the banks. Degradation is expected to continue until the slope of the channel is adjusted to provide only the velocities necessary to transport the available sediment. Future adjustments in the reach of the channel through the landslide may endanger some works of man and cause environmental changes to the river downstream from the landslide. (Knapp-USGS)
W73-09445

ROLE OF ATMOSPHERIC PRECIPITATION AND GROUNDWATER IN THE FORMATION OF LANDSLIDES ON THE LEFT BANK OF THE CHIRCHIK RIVER (O ROLI ATMOSFERNYKH OSADKOV I PODZEMNYKH VOD V FORMIROVANII OPOLZNEY LEVOBEREZH-'YA R. CHIRCHIK),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
G. A. Mavlyanov, and K. A. Artykov.
Uzbekskiy Geologicheskiy Zhurnal, No 2, p 68-71, 1971. 1 fig, 3 ref.

Descriptors: *Landslides, *Precipitation (Atmospheric), *Groundwater, Loess, Moisture content, Wetting, Pressure, Drainage.
Identifiers: *USSR, *Chirchik River.

New landslides occur each year in upper reaches of the Chirchik River, particularly in the Bel'dersay, Gel'vasay, and Chimgansay basins. The main factor responsible for landslides in the region is the high natural moisture content of loess, which is continuously replenished by groundwater. Despite a relation between rainfall and landslide frequency, precipitation plays a secondary role. Landslide control to reduce the natural moisture content of loess includes drainage of the slide area provided the interstitial water under pressure at the contact between bedrock and loess is drained. (Josefson-USGS)
W73-09465

STRATIGRAPHY OF THE JACKSON GROUP IN EASTERN GEORGIA,
Georgia Univ., Athens. Dept. of Geology.
R. E. Carver.
Southeastern Geology, Vol 14, No 3, p 153-181, September 1972. 6 fig, 1 tab, 31 ref, 1 append. OWRR A-006-GA (10).

Descriptors: *Geology, *Sediments, *Geological surveys, *Georgia, Data collections, Geologic formations, Geomorphology, Geochemistry, Geologic history, Sediment transport, Sediment distribution, *Stratigraphy, Sedimentary structures.
Identifiers: *Jackson Group (Ga).

The depositional strike of the Jackson Group in eastern Georgia, based on locations of known outcrops of the Albian member of the Barnwell formation, is approximately N80 deg E. Because the trend of the fall line between Macon and Augusta is about N65 deg E, exposures of the Jackson Group near Macon represent more typically marine facies than do outcrops near Augusta. The Jackson Group is predominantly Upper Eocene in age. It is a transgressive-regressive sequence with a thin, extensively developed transgressive sand and a much thicker, more complex fine to course clastic regressive phase. In down-dip areas the group is represented by the Ocala Limestone; in up-dip areas, by fluviatile sediments indistinguishable from the late Cretaceous to possibly Middle Eocene Middendorf Formation. Between the down-dip marine limestone facies and the up-dip fluviatile facies occurs a lithologically complex near-shore facies, the Barnwell Formation. While general patterns of lighologic distribution can be recognized and the formation roughly divided into members, individual lithologic units are lenticular or deeply channeled and can not be traced over distances of more than a few miles. (Woodard-USGS)
W73-09586

ANALYTICAL METHODS FOR RUTHENIUM--106 IN MARINE SAMPLES,
Institute of Public Health, Tokyo (Japan). Dept. of Radiological Health.
For primary bibliographic entry see Field 05A.
W73-09648

ENVIRONMENTAL ASPECTS OF DREDGING IN ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05C.
W73-09651

THE REGULARITIES OF VERTICAL DISTRIBUTION OF BENTHOS IN BOTTOM SEDIMENTS OF THREE MASURIAN LAKES,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 02H.
W73-09750

2K. Chemical Processes

IRON IN SURFACE AND SUBSURFACE WATERS, GRIZZLEY BAR, SOUTHEASTERN ALASKA,
Alaska Univ., College. Dept. of Geology.
For primary bibliographic entry see Field 05A.
W73-09111

ECOLOGICAL STUDIES OF THE SURFACE WATERS OF THE WHITEWATER CREEK WATERSHED, WALWORTH, ROCK AND JEFFERSON COUNTIES, WISCONSIN,
For primary bibliographic entry see Field 04C.
W73-09117

CHEMICAL QUALITY OF SURFACE WATER IN THE FLAMING GORGE RESERVOIR AREA, WYOMING AND UTAH,
Geological Survey, Washington, D.C.
R. J. Madison, and K. M. Waddell.
Geological Survey Water-Supply Paper 2009-C, 1973. 18 p, 8 fig, 1 plate, 3 tab, 4 ref.

Descriptors: *Water quality, *Dissolved solids, *Reservoirs, *Wyoming, *Utah, Leaching, Evaporation, Water chemistry, Sulfates, Bicarbonates.
Identifiers: *Flaming Gorge Reservoir, Green River.

The major inflow to the Flaming Gorge Reservoir, Wyoming and Utah, is from the Green River, which contributes an average of 81% of the water and 59% of the inflow load of dissolved solids. Together, Blacks Fork and Henrys Fork contribute about 16% of the water and about 23% of the dissolved-solids load, whereas minor tributaries contribute approximately 3% of the total inflow water to the reservoir, but about 18% of the total incoming load of dissolved solids. The concentration of dissolved solids in the reservoir in October 1966 was about 150 mg/liter greater than the concentration of the 1962-66 inflow. The increased concentration is due mostly to leaching of minerals from the reservoir bottom. The major difference between the chemical composition of the inflow during 1963-66 and that of the reservoir in 1966 is an increase in sulfate and a decrease in bicarbonate. Impoundment caused the concentration of dissolved solids in the river system to increase by about 32%. Evaporation accounted for an increase of 15 mg/liter, and leaching accounted for an increase of 115 mg/liter. (Knapp-USGS)
W73-09127

GROUNDWATER RESOURCES OF THE NORCO AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-09128

DIFFUSION IN DILUTE POLYMETRIC SOLUTIONS,
Delaware Univ., Newark. Dept of Chemical Engineering.
For primary bibliographic entry see Field 01B.
W73-09134

OXYGEN DISTRIBUTION IN THE PACIFIC OCEAN,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 02E.
W73-09147

CONCENTRATIONS OF BIOGENIC ELEMENTS IN THE MOZHAYSK RESERVOIR (ZAPASY BIOGENNYKH ELEMENTOV V MOZHAYSKOM VODOKHRANILISHCHE),
Moscow State Univ. (USSR). Chair of Hydrology.
For primary bibliographic entry see Field 02H.
W73-09151

ROLE OF SEA SALTS IN THE SALT COMPOSITION OF RAIN AND RIVER WATERS,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
V. D. Korzh.
Oceanology, Vol 12, No 3, p 355-362, 1972. 1 fig, 3 tab, 39 ref. Translated from Okeanologiya (USSR), Vol 12, No 3, p 423-430, 1972.

Descriptors: *Oceanography, *Water chemistry, *Salts, *Rain water, *Rivers, Runoff, Hydrologic cycle, Meteoric water, Precipitation (Atmospheric), Atmosphere, Oceans, Sea water, Chlorides, Trace elements, Aerosols, Equations.
Identifiers: *USSR.

A quantitative determination of the role of the ocean in supplying salts to atmospheric precipitation and river water is based on the assumption that salts are carried to continents in the same proportion as they occur in atmospheric moisture over the ocean. The closeness of chloride ratios computed for Li, Na, Rb, Cs, B, and I at the ocean surface and determined from their concentrations in global river runoff indicate that B, I, Cl, Li, Na, Rb, and Cs are mainly cyclic, i.e., they reach land from the ocean through the atmosphere and return to the ocean with river runoff. The most likely proportion of cyclic salts in rainwater over the USSR is 14%-28% and in global river runoff, 6%-15%. According to computations, the actual values should approximate the upper limits. (Josefson-USGS)
W73-09152

RECOMMENDED METHODS FOR WATER DATA ACQUISITION.
For primary bibliographic entry see Field 07A.
W73-09161

WORLDWIDE SULFUR POLLUTION OF RIVERS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W73-09169

INSTRUMENTATION FOR ENVIRONMENTAL MONITORING: WATER.
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 07B.
W73-09268

SURFACE WATER TEMPERATURES AT SHORE STATIONS, UNITED STATES WEST COAST, 1971.
Scripps Institution of Oceanography, La Jolla, Calif.

Availabile from NTIS, Springfield, Va 22151 AD-749 031 Price $3.00 printed copy; $0.95 cents microfiche. Data Report (SIO Reference 72-62), June 1972. 21 p. ONR Contract N00014-69-A-0200-6006.

Descriptors: *Water temperature, *Salinity, *Pacific Ocean, *Coasts, *United States, Sampling, Measurement, Data collections, Washington, Oregon, California, Surface waters, Methodology.

Temperature and salinity data are presented from observations made during 1971 at shoreline stations along the west coast of the United States from the Strait of Juan de Fuca, Washington, to La Jolla, California. The data consist of monthly means, ranges and standard deviations based on daily observations. Daily temperature and salinity values from which the means were derived are reproduced by computer for limited distribution and are available, upon request, for the cost of reproduction. The agencies that participated are: Hopkins Marine Station, National Oceanic and Atmospheric Administration/National Ocean Survey, U. S. Coast Guard, the California State Park System, Oregon State University, Pacific Gas and Electric Company, and Scripps Institution of Oceanography of the University of California, San Diego. Temperature readings and water samples were obtained from surf and sandy beaches, off rocky cliffs and ledges, over the sides of lightships and off piers, depending upon the station location. All stations, excluding those of NOAA/NOS and those reporting to Oregon State University, are maintained in cooperation with Scripps Institution of Oceanography. (Woodard-USGS)
W73-09269

WEATHERING OF MICACEOUS CLAYS IN SOME NORWEGIAN PODZOLS,
Norges Landbrukshoegskole, Vollebekk. Inst. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-09275

WATER RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1973.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W73-09278

PROGRESS REPORT ON WATER-RESOURCES INVESTIGATIONS IN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-09284

HYDROLOGY OF THE MARTINSBURG FORMATION IN LEHIGH AND NORTHAMPTON COUNTIES, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02F.
W73-09286

GEOHYDROLOGY OF THE NEEDLES AREA, ARIZONA, CALIFORNIA, AND NEVADA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-09287

THE FRACTIONATION OF HUMIC ACIDS FROM NATURAL WATER SYSTEMS,
Geological Survey, Lakewood, Colo.
R. L. Wershaw, and D. J. Pinckney.
Journal of Research of the U S Geological Survey, Vol 1, No 3, p 361-366, May-June 1973. 2 fig, 31 ref.

Descriptors: *Humic acids, *Water analysis, *Chromatography, Analytical techniques, Adsorption, Organic matter, Chemical analysis.
Identifiers: *Adsorption chromatography.

Humic acids, the most abundant organic components of natural water systems, are complex mixtures of molecular aggregates of different chemical and physical properties. The first step in the study of such a mixture is the fractionation of the mixture. The most common approach with humic acids is to attempt to obtain a molecular weight fractionation by gel-permeation chromatography. However, since the preponderance of evidence indicates that the components of humic acid do not fulfill the basic criteria of uniform shape and chemical structure necessary for obtaining a molecular fractionation on gel-permeation media, molecular weight distributions in humic acids cannot be evaluated by this method. A fractionation dependent upon chemical structure can be obtained by the manipulation of elution conditions on a gel-permeation column. This procedure provides a beginning in the isolation and identification of discrete components of humic acids. (Knapp-USGS)
W73-09295

FLUORITE EQUILIBRIA IN THERMAL SPRINGS OF THE SNAKE RIVER BASIN, IDAHO,
Geological Survey, Menlo Park, Calif.
C. E. Roberson, and R. Schoen.
Journal of Research of the U S Geological Survey, Vol 1, No 3, p 367-370, May-June 1973. 3 tab, 5 ref.

Descriptors: *Fluorides, *Thermal water, *Thermal springs, *Idaho, *Water chemistry, Hot springs, Equilibrium, Mineralogy, Mineral water.
Identifiers: *Fluorite, *Snake River basin (Idaho).

Some thermal water sources of the Snake River basin, Idaho, are near saturation with respect to fluorite. Fluorite was identified by X-ray diffraction in precipitates induced in three water samples by adding sodium fluoride. The derived solubility product for zero ionic strength was close to that calculated from Latimer's thermodynamic data. The relative ease of precipitation of fluorite from

these water samples indicates that equilibrium with respect to fluorite may occur in some groundwater systems. (Knapp-USGS)
W73-09296

TEMPERATURE COEFFICIENTS AND THEIR COMPENSATION IN ION-SELECTIVE SYSTEMS,
Foxboro Co., Mass.
For primary bibliographic entry see Field 05A.
W73-09371

WATER SAMPLING DEVICE,
Department of the Navy, Washington, D.C. (assignee)
For primary bibliographic entry see Field 07B.
W73-09401

QUALITY OF STREAM WATERS OF THE WHITE CLOUD PEAKS AREA, IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09435

FLIGHT TEST OF AN OCEAN COLOR MEASURING SYSTEM,
TRW Systems Group, Redondo Beach, Calif. Display and Imaging Dept.
For primary bibliographic entry see Field 07B.
W73-09440

PRELIMINARY STUDIES OF COLLOIDAL SUBSTANCES IN THE WATER AND SEDIMENTS OF THE CHESAPEAKE BAY,
Geological Survey, Washington, D.C.
I. A. Breger, P. Zubovic, and J. C. Chandler.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C263-C265, 1972. 1 fig, 4 tab, 2 ref.

Descriptors: *Colloids, *Suspended load, *Bottom sediments, *Chesapeake Bay, Magnesium, Manganese, Water chemistry, Mineralogy.
Identifiers: *Manganese nodules.

Colloidal substances passing through a 1.2-micrometer filter but retained by a 0.0024-micrometer membrane were isolated from both water and sediment of the Chesapeake Bay. The colloidal fraction obtained from the water had a high content of magnesium, whereas the colloidal fraction from the sediment had a high content of manganese. Further study of the colloidal substances isolated from the sediment may provide an explanation for the formation of manganese nodules. (Knapp-USGS)
W73-09443

SPECIFIC-CONDUCTANCE SURVEY OF THE MALAD RIVER, UTAH AND IDAHO,
Geological Survey, Logan, Utah.
L. J. McGreevy.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C239-C242, 1972. 3 fig, 3 ref.

Descriptors: *Salinity, *Water quality, *Water pollution sources, *Utah, *Mineral water, Warm springs, Specific conductivity, Idaho.
Identifiers: *Malad River (Utah).

A specific-conductance survey of the Malad River, Utah, August 12-13, 1971, indicates that Woodruff Warm Springs and Udy Hot Springs are sources of large amounts of dissolveds solids in the river, and flow derived from other sources contains a relatively low average concentration of dssolved solids. Conditions at the time of the survey generally represent average June-September conditions. At the time of the survey, most of the water in the drainage system upstream from Woodruff Warm Springs was diverted for irrigation. (Knapp-USGS)
W73-09448

NATURAL BACKGROUND CONCENTRATION OF MERCURY IN SURFACE WATER OF THE ADIRONDACK REGION, NEW YORK,
Geological Survey, Albany, N.Y.
W. Buller.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C233-C238, 1972. 2 fig, 2 tab, 17 ref.

Descriptors: *Water chemistry, *Mercury, Public health, Data collections, Water quality, Heavy metals, Surveys, *New York.
Identifiers: *Adirondack region (N Y).

Natural background concentrations of mercury in water supplies are not well known. Establishment of these natural background concentrations requires the study of areas relatively free of man's influence on the environment. The Adirondack region of New York State is such an area. Determinations of mercury concentration of samples collected from streams and lakes of the Adirondack region in fall, winter, and spring 1970-71 indicate that the natural background concentration of mercury is less than 0.5 micrograms per liter, which is less than one-tenth the 5 micrograms per liter limit recommended for drinking water in New York. (Knapp-USGS)
W73-09449

DETERMINATION OF SILVER IN SOILS, SEDIMENTS, AND ROCKS BY ORGANIC-CHELATE EXTRACTION AND ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Geological Survey, Denver, Colo.
T. T. Chao, J. W. Ball, and H. M. Nakagawa.
Analytica Chimica Acta, Vol 54, p 77-81, 1971. 2 fig, 2 tab, 6 ref.

Descriptors: *Chemical analysis, *Metals, Sediments, *Soil chemistry, *Trace elements, Rocks, Analytical techniques, Organic matter, Acids, Spectrophotometry, Spectroscopy.
Identifiers: *Silver determinations, Atomic absorption spectrophotometry, Triisooctyl thiophosphate, Methyl isobutyl ketone, Nitric acid.

A method for the determination of silver in soil, sediment, and rock samples in geochemical exploration is presented. The sample is digested with concentrated nitric acid, and the silver extracted with triisooctyl thiophosphate (TOTP) in methyl isobutyl ketone (MIBK) after dilution of the acid digest to approximately 6 moles. The extraction of silver into the organic extractant is quantitative and not affected by the nitric acid concentration from 4 to 8 moles, or by different volumes of TOTP-MIBK. The extracted silver is stable and remains in the organic phase for several days. The silver concentration is determined by atomic absorption spectrophotometry. (Woodard-USGS)
W73-09451

GEOLOGY AND GROUND-WATER RESOURCES OF PRATT COUNTY, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 04B.
W73-09453

CHEMICO-OSMOTIC EFFECTS IN FINE--GRAINED SOILS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W73-09455

FLUORIDE CONCENTRATIONS IN WATERS OF THE MOLDAVIAN ARTESIAN BASIN (K VOPROSU OB USLOVIYAKH FORMIROVANIYA FTORSODERZHASHCHIKH VOD MOLDAVSKOGO ARTEZIANSKOGO BASSEYNA),
Leningrad State Univ. (USSR).
Ye. V. Petrakov, E. V. Kozlova, and N. A. Sargsyants.
Vestnik Leningradskogo Universiteta, No 12, Geologiya-Geografiya, No 2, p 69-72, June 1972. 1 fig, 3 tab, 5 ref.

Descriptors: *Water properties, *Water quality, *Fluorides, *Groundwater basins, *Artesian aquifers, Rocks, Sedimentary rocks, Igneous rocks, Mineralogy, Salts, Leaching, Geologic time, Chemical analysis.
Identifiers: *USSR, *Moldavia.

Fluoride concentrations in groundwater of the Moldavian artesian basin are extremely high, reaching 20 mg/liter. An analysis of the conditions of formation of these waters shows a clear genetic relation of fluorides to both marine sedimentary rocks and igneous rocks. (Josefson-USGS)
W73-09457

DETERMINATION OF THE AGE OF GROUNDWATER IN THE FERGANA ARTESIAN BASIN (OB OPREDELENII VOZRASTA PODZEMNYKH VOD FERGANSKOGO ARTEZIANSKOGO BASSEYNA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 02F.
W73-09466

HAIR AS A BIOPSY MATERIAL,
Agricultural Research Service, Grand Forks, N. Dak. Human Nutrition Lab.
For primary bibliographic entry see Field 05A.
W73-09467

DETERMINATION OF MERCURY IN SOILS BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Department of Scientific and Industrial Research, Petone (New Zealand).
For primary bibliographic entry see Field 05A.
W73-09471

AVAILABILITY OF MANGANESE AND IRON TO PLANTS AND ANIMALS,
West Virginia Univ., Morgantown. Dept. of Animal Industries and Veterinary Science.
D. J. Horvath.
Geological Society of America Bulletin, Vol 83, p 451-462, February 1972. 10 tab, 72 ref.

Descriptors: *Iron, *Manganese, *Trace elements, *Soil, *Plants, *Animals, Agriculture, Animal pathology, Hydrogen ion concentration, Geochemistry, Grazing, Nutrients, Fertilizers, Domestic animals, Zinc, Copper, Nitrogen, Heavy metals, Potassium, Soil investigations, Soil chemistry.

Mn and Fe are essential to both plants and animals and are transferred successfully from the soil in all situations in which life persists. At the soil:plant interface pH and Eh are dominant factors and are frequently regulated by agronomic technology. Of the plant macronutrients used in fertilizer, P is most likely to reduce directly the availability of Fe

and Mn. Availability of Fe and Mn of plants to animals is characteristically described as low, in the order of 1/10. However, availability increases during deficiency and, in the case of Fe, following hemorrhage. Fe deficiency is considered one of the most common trace-element deficiencies of man. Intensive agronomic practices will have little effect, however, on the Fe or Mn status of grazing animals; and, consequently are likely to be damped. (Oleszkiewicz-Vanderbilt)
W73-09474

SELENIUM DEFICIENCY IN SOILS AND ITS EFFECT ON ANIMAL HEALTH,
Oregon State Univ., Corvallis. Dept. of Animal Science.
J. E. Oldfield.
Geological Society of America Bulletin, Vol 83, No 1, p 173-180, January 1972. 52 ref.

Descriptors: *Heavy metals, *Soils, *Animal pathology, *Pathology, *Trace elements, Irrigation, Agriculture, Nutrient requirements, Nutrients, Animal physiology, Forages, Chemical reactions, Hazards, Soil chemistry, Soil investigations.
Identifiers: *Selenium.

Selenium in minute quantities has been shown to be a dietary essential for animal life, and soil-plant-animal relations have been identified in the distribution of the element. In some cases, soils are frankly deficient in selenium - most particularly those derived from igneous rocks, and the deficiency in surface layers may be aggravated by intensive irrigation. Analytical surveys have revealed also that considerable variation exists among plant species in their abilities to take up and retain selenium from the soil. Some experiments have investigated the effectiveness of additions of selenium to the soil in overcoming selenium deficiency among farm animals. Protection for 2 years has been achieved by this technique; however, the various factors influencing the soil-plant-animal relations of selenium direct caution in its application. (Oleszkiewicz-Vanderbilt)
W73-09476

NICKEL EXPLORATION BY NEUTRON CAPTURE GAMMA RAYS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-09480

DETERMINATION OF MERCURY IN NATURAL WATERS AND EFFLUENTS BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Central Inst. for Industrial Research, Oslo (Norway).
For primary bibliographic entry see Field 05A.
W73-09481

SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF MERCURY (II) BY EXTRACTION WITH BINDSCHEDLER'S GREEN,
Tottori Univ. (Japan). Faculty of Education.
For primary bibliographic entry see Field 05A.
W73-09482

NATURAL WATERS IN AMAZONIA: V. SOLUBLE MAGNESIUM PROPERTIES,
Instituto Nacional de Pesquisas da Amazonia, Manaus (Brazil).
W. L. F. Brinkmann, and A. Dos Santos.
Turrialba. Vol 21, No 4, p 459-465. 1971. Illus.
Identifiers: *Amazonia, *Brazil, *Magnesium, Microorganisms, Natural waters, Solubility, Trees.

In the Tertiary region of Amazonia, near Manaus, the principal sources of Mg in the natural waters are the water that flows over the trunks of trees and all the forest water in general. The Mg content comes from 'washings' of foliage, tops of trees, trunks and buds by rain water and, up to a certain point, the solution of metabolic products of macro-and micro-organisms. Soil water contained some Mg, but in rain water and brooks only traces were found. Mg can be regarded as an element circulating within the closed system of the humid tropical forest. In comparison with the Mg content of natural waters in the world as a whole, the concentrations found in the circulating waters of tertiary Amazonia are extremely low.--Coyright 1972, Biological Abstract, Inc.
W73-09497

NOVEL WET-DIGESTION PROCEDURE FOR TRACE-METAL ANALYSIS OF COAL BY ATOMIC ABSORPTION,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Mining and Safety Research Center.
For primary bibliographic entry see Field 05A.
W73-09506

NOTES ON THE DETERMINATION OF MERCURY IN GEOLOGICAL SAMPLES,
Imperial Coll. of Science and Technology, London (England). Dept. of Geology; and Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 05A.
W73-09509

POTENTIOMETRIC TITRATION OF SULFATE IN WATER AND SOIL EXTRACTS USING A LEAD ELECTRODE,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. O. Goertzen, and J. D. Oster.
Soil Sci Soc Am Proc. Vol 36, No 4, p 691-693, 1972. Illus.
Identifiers: Electrodes, Lead, *Potentiometric titration, Soils, *Sulfates, Titration, Water pollution sources.

Sulfate concentrations in natural waters and soil-water extracts were determined semiautomatically using a pb-ion electrode to indicate the solution potential change at the endpoint, a constant flow device to deliver the titrant, a pH-mV meter to measure the potential, and a strip chart recorder to plot the solution potential thus indicating the endpoint. Sulfate concentrations as low as 0.5 meq/liter in the sample solution were determined by the potentiometric titration system. This semiautomated direct titration of sulfate has the advantages of increased sensitivity and speed as compared with the precipitation method.--Copyright 1973, Biological Abstracts, Inc.
W73-09518

GASEOUS LOSSES OF NITROGEN FROM FRESHLY WETTED DESERT SOILS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-09519

HYDROLYSIS OF PROPAZINE BY THE SURFACE ACIDITY OF ORGANIC MATTER,
Agricultural Research Service, Beltsville, Md. Soils Lab.
For primary bibliographic entry see Field 05B.
W73-09520

CHARACTERIZATION OF THE OXIDIZED AND REDUCED ZONES IN FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-09522

THE GROWTH, COMPOSITION AND NUTRIENT UPTAKE OF SPRING WHEAT: EFFECTS OF FERTILIZER-N, IRRIGATION AND CCC ON DRY MATTER AND N, P, K, CA, MG, AND NA,
Rothamsted Experimental Station, Harpenden (England).
For primary bibliographic entry see Field 03F.
W73-09552

A NEW METHOD FOR THE GAS CHROMATOGRAPHIC SEPARATION AND DETECTION OF DIALKYLMERCURY COMPOUNDS-APPLICATION TO RIVER WATER ANALYSIS,
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
For primary bibliographic entry see Field 05A.
W73-09584

CATALYTIC OXIDATION OF PHENOL OVER COPPER OXIDE IN AQUEOUS SOLUTION,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-09587

GROUND-WATER RESOURCES OF BRAZORIA COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-09590

GROUND-WATER RESOURCES OF DONLEY COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-09591

AN EVALUATION OF APHA METHOD FOR DETERMINING ARSENIC IN WATER,
Environmental Health Lab., McClellan AFB, Calif.
For primary bibliographic entry see Field 05A.
W73-09593

THE CHEMICAL TYPE OF WATER IN FLORIDA STREAMS,
Geological Survey, Tallahasse, Fla.
For primary bibliographic entry see Field 07C.
W73-09594

GEOHYDROLOGY OF SUMTER, DOOLY, PULASKI, LEE, CRISP, AND WILCOX COUNTIES, GEORGIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09619

ANALYTICAL METHODS FOR RUTHENIUM--106 IN MARINE SAMPLES,
Institute of Public Health, Tokyo (Japan). Dept. of Radiological Health.
For primary bibliographic entry see Field 05A.
W73-09648

CHEMICAL COMPOSITION OF ZARAFSHAN RIVER WATER (IN RUSSIAN),
Selskokhozyaistvennyi Institut, Samarkand (USSR).
Ch. N. Takhtamyshev.
Probl Osvoeniya Pustyn'. 3, p 73-77. 1972. Illus. English summary.
Identifiers: *Chemicals, Rivers, USSR, *Zarafshan River.

In the Zarafshan upper reaches carboniferous waters predominate. Middle-stream they change into carbonate-sulfuric and sulfuric-hydrocarbonic waters and down-stream-into sulfurous ones.

Changes in the chemical composition of the river water are caused by the variety of underlaying strata, by the character of water supply sources and amounts of drainage, irrigation and flood water discharge into the riverbed.--Copyright 1972, Biological Abstracts, Inc.
W73-09657

2L. Estuaries

PULSED NEON LASER BATHYMETRIC STUDIES USING SIMULATED DELAWARE BAY WATERS,
Sparcom Inc., Alexandria, Va.
G. D. Hickman, J. E. Hogg, and A. H. Ghovanlou.
Technical Report No 1, September, 1972. 79 p, 26 fig, 10 tab, 80 ref, append.

Descriptors: *Bathymetry, *Bays, *Delaware, *Remote sensing, *Turbidity, Aircraft, Instrumentation, Light penetration, Model studies, Measurement, Depth, Air-water interfaces, Methodology, Reflectance.
Identifiers: *Laser bathymetry, *Delaware Bay.

Measurements and calculations are presented concerning the feasibility of deploying in airborne laser transmitter/receiver system to measure water depths in highly turbid water. A new technique is described for simulating natural turbidity conditions in the laboratory. The results of simulating conditions in Delaware Bay show that 15 attenuation lengths is the maximum depth of water that can be penetrated to yield detectable signals by an airborne neon laser/receiver system flying at an altitude of 500 meters. The average sediment loading in Delaware Bay which was measured was approximately 4 mg/liter. It is estimated that a well designed airborne system could map 70% of the bathymetry of Delaware Bay. The depth and spatial resolution for this system would be approximately 0.3 meters and 3 square meters, respectively. (Woodard-USGS)
W73-09138

A HYDROLOGICAL MODEL FOR ESTIMATING THE INFLOWS TO AND OUTFLOWS FROM GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept of Civil Engineering.
E. F. Brater.
Technical Report No 32, August, 1972. 22 p, 8 fig, 4 tab, 2 ref.

Descriptors: *Hydraulic models, *Hydrology, *Bays, *Michigan, Hydrologic data, Inflow, Discharge (Water), Lake Michigan, Hydrologic equation, Forecasting, Rainfall-runoff relationships, Groundwater movement.
Identifiers: *Grand Traverse Bay (Mich).

Estimates of inflow and outflow are provided for any selected portion of Grand Traverse Bay, Michigan. The determination was made first for the 17-year period from 1953 to 1971 for which continuous records are available on the upper Boardman River. For this period it was necessary to find relations between the discharges of the gaged and ungaged portions of the basin. In order to extend inflow and outflow farther into the past or into the future, a deterministic hydrological model was developed for relating runoff to precipitation. This model enables the extension of the estimated inflow and outflow rates with accuracy over as many years as the amount of rainfall is recorded or can be estimated. The inflow to Grand Traverse Bay is the runoff from a drainage area of 973 square miles, of which only that from the Boardman basin above Mayfield (189 square miles) had been gaged. It is estimated that more than 95% of the river discharge is groundwater. The inflows to the bay as well as the outflows to Lake Michigan can be computed for the period starting in 1889 when the first rain gage was established in the area. More than 80 years of hydrologic data could be provided which would supply a dependable basis for predicting future conditions. (Woodard-USGS)
W73-09139

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT.
Delaware Univ., Newark.

Available from NTIS, Springfield, Va. 22151 as AD-752 503, Price $3.00 printed copy; $0.95 microfiche. Annual Status Report, November, 1972. 43 p, 9 fig, 12 ref. ONR N00014-69-A0407.

Descriptors: *Sediment transport, *Coasts, *Littoral drift, *Delaware, Projects, Data collections, Beaches, Ocean currents, Ocean waves, Environment, Winds, Soils, Vegetation, Shores, Estuaries, Bays, New Jersey, Maryland, Atlantic Ocean, Shore protection, Tidal effects.
Identifiers: *Delaware Bay.

Accomplishments are presented for the third year of an interdisciplinary investigation of the coastal processes and salient physical characteristics of a section of the Atlantic seacoast comprising Delaware Bay and adjoining areas in New Jersey and Maryland. This study, sponsored by the Geography Programs of the Office of Naval Research, is intended to provide thorough basic knowledge of this representative coastal zone that can be applied to similar littoral areas throughout the world in order to identify offshore, tidal zone, beach, and backshore surface and subsurface features from limited and preferably remote observations. Studies that were completed in 1972 include: the testings, correlation and alteration of mechanical properties of soils; vivianite as a cementitious material in soil stabilization; generation of water waves by wind; microclimatological investigations in coastal areas; rooted aquatics and their interaction with sublittoral sedimentary processes; and soil and vegetation characteristics of a low-lying marsh fringe-sand barrier coastline. (Woodard-USGS)
W73-09144

HYDROGRAPHIC OBSERVATIONS IN ELKHORN SLOUGH AND MOSS LANDING HARBOR, CALIFORNIA, OCTOBER 1970 TO NOVEMBER 1971,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 05B.
W73-09162

DEEP SEA SEDIMENTS AND THEIR SEDIMENTATION, GULF OF MEXICO,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-09165

PRECISION REQUIREMENTS FOR A SPACECRAFT TIDE PROGRAM,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 07B.
W73-09170

MICROBIOLOGICAL SEA WATER CONTAMINATION ALONG THE BELGIAN COAST, I - GEOGRAPHICAL CONSIDERATIONS,
Belgian Army Military Hospital, Ostend. Lab. for Sea Microbiology.
For primary bibliographic entry see Field 05B.
W73-09203

UTILIZATION OF CARD-FLOATS FOR THE STUDY OF SURFACE DRIFT AND APPLICATION IN THE PREVENTION OF COASTAL POLLUTION (UTILISATION DE CARTES-FLOTTEURS POUR L'ETUDE DES DERIVES DE SURFACE ET APPLICATION A LA PREVISION DES P OLLUTIONS CATIERES),
Service Hydrographique de la Marine, Paris (France).
For primary bibliographic entry see Field 05B.
W73-09210

THE POLLUTION OF THE COASTS AND EFFLUENTS IN THE SEA (LA POLLUTION DES COTES ET LES REJETS EN MER),
For primary bibliographic entry see Field 05G.
W73-09215

EFFECTS OF MAN'S ACTIVITIES ON ESTUARINE FISHERIES,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-09216

A TRACER SIMULATION OF WASTE TRANSPORT IN THE MUDDY CREEK-RHODE RIVER ESTUARY, MARYLAND,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 05B.
W73-09217

ANTIBIOTIC-RESISTANT COLIFORMS IN FRESH AND SALT WATER,
Alabama Univ., Birmingham. Medical Center.
For primary bibliographic entry see Field 05B.
W73-09218

POLLUTION CONTROL ASPECTS OF THE BAY MARCHAND FIRE,
For primary bibliographic entry see Field 05G.
W73-09231

MERCURY IN THE NETHERLANDS ENVIRONMENT, (KWIK IN HET NEDERLANDSE MILIEU (SLOT)),
For primary bibliographic entry see Field 05B.
W73-09237

SURFACE WATER TEMPERATURES AT SHORE STATIONS, UNITED STATES WEST COAST, 1971.
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02K.
W73-09269

EXCHANGE PROCESSES IN SHALLOW ESTUARIES,
Miami Univ., Fla. Sea Grant Institutional Program.
T. N. Lee, and C. Rooth.
Available from NTIS, Springfield, Va 22151 COM-72 10671 Price $3.00 printed copy; $1.45 microfiche. Special Bulletin No 4, January 1972. 33 p, 13 fig, 3 ref, 1 append. NOAA Sea Grant No 2-35147.

Descriptors: *Flow characteristics, *Estuaries, *Shallow water, *Model studies, Forecasting, Mixing, Tidal effects, Salinity, Water circulation, Winds, Bays, *Florida, Currents (Water), Analytical techniques, Dye releases, Dispersion, Diffusion, Tracking techniques, Inflow, Freshwater, Saline water intrusion.
Identifiers: *Biscayne Bay (Fla).

A modular approach to the analysis of mixing and flow cjaracteristics in shallow tidal estuaries is presented using South Florida's Biscayne Bay as an example. The method depends on isolating rela-

tively simple characteristic flow regimes in different parts of an estuary. These can be considered as building blocks, which when recombined in different configurations are capable of yielding a qualitative model for a specific estuary. Such models are of immediate value in preliminary assessments of estuarine water quality and interaction problems. This method can provide an effective base for further studies where more precise information is needed. Wind effects were found to have a great influence on exchange processes in the study estuary. Wind effects mix the estuary horizontally and vertically and can set up a mean circulation that advects interior water into the direct exchange region of the tidal inlets, thereby substantially decreasing the basin's flushing time. (Woodard-USGS)
W73-09283

POLYCHAETOUS ANNELIDS COLLECTED BY 'UMITAKA-MARU' FROM THE ARABIAN GULF,
Kuwait Univ. Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W73-09341

USE OF A COMMERCIAL DREDGE TO ESTIMATE A HARDSHELL CLAM POPULATION BY STRATIFIED RANDOM SAMPLING,
Rhode Island Dept. of Natural Resources, Providence. Div. of Fish and Wildlife.
For primary bibliographic entry see Field 05B.
W73-09348

AN INSTRUMENT FOR MEASURING CONDUCTIVITY PROFILES IN INLETS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05A.
W73-09349

TRANSITION OF POLLUTION WITH MERCURY OF THE SEA FOOD AND SEDIMENTS IN MINAMATA BAY (IN JAPANESE),
Kumamoto Univ. (Japan). Dept. of Hygiene.
For primary bibliographic entry see Field 05B.
W73-09416

GRAYS HARBOR ESTUARY, WASHINGTON: REPORT 3, WESTPORT SMALL-BOAT BASIN STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-09438

REGIONAL RATES OF GROUND-WATER MOVEMENT ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 02F.
W73-09441

PRELIMINARY STUDIES OF COLLOIDAL SUBSTANCES IN THE WATER AND SEDIMENTS OF THE CHESAPEAKE BAY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-09443

COMMON MARSH, UNDERWATER AND FLOATING-LEAVED PLANTS OF THE UNITED STATES AND CANADA,
For primary bibliographic entry see Field 02I.
W73-09548

ON THE POPULATION ECOLOGY OF THE COMMON GOBY IN THE YTHAN ESTUARY,
Fisheries Research Board of Canada, Winnipeg (Manitoba).
M. C. Healey.
J Nat Hist. Vol 6, No 2, p 133-145, 1972, Illus.
Identifiers: Ecology, Estuaries, Gobius-Microps, *Goby, Population ecology, *Scotland, *Ythan estuary.

The abundance of common gobies (Gobius microps) was measured in 2 areas of the Ythan estuary, Scotland, at different time of the year. Information on their growth, reproduction and food habits is presented.--Copyright 1972, Biological Abstracts, Inc.
W73-09557

THE OCCURRENCE AND FOOD HABITS OF TWO SPECIES OF HAKE, UROPHYCIS REGIUS AND U. FLORIDANUS IN GEORGIA ESTUARIES,
Georgia Univ., Sapelo Island. Marine Inst.
W. B. Sikora, R. W. Heard, and M. D. Dahlberg.
Trans Am Fish Soc. Vol 101, No 3, p 513-525. 1972. Illus.
Identifiers: *Fish diets, Amphipoda, Estuaries, *Georgia, *Hake, Macrura, Mysidacea, Natantia, Urophycis floridanus, Urophycis regius.

From 1967-1970 a total of 2683 spotted hake, U. regius and 470 southern hake, U. floridanus were collected and found to exhibit migratory patterns in Georgia similar to northern and Gulf populations of these fish. The food habits of inshore juvenile populations of these 2 species of hake collected from coastal salt march-estuarine areas near Sapelo Island, Georgia were examined. The 341 spotted hake and 192 southern hake examined contained identifiable food items. These were analyzed for the numbers of individual food organisms, percent frequency of occurrence, and percent biomass. The most important group in occurrence and biomass was the Crustacea with Natantia most important gravimetrically, Amphipoda and Mysidacea most frequently occurring. These data when combined with the habits of the food organisms established these 2 hakes as species which use the estuary as 'nursey grounds'.--Copyright 1973, Biological Abstracts, Inc.
W73-09565

DISTRIBUTION AND ABUNDANCE OF YOUNG-OF-THE-YEAR STRIPED BASS, MORONE SAXATILIS, IN RELATION TO RIVER FLOW IN THE SACRAMENTO-SAN JOAQUIN ESTUARY,
California State Dept. of Fish and Game, Stockton. Anddromous Fisheries Branch.
J. L. Turner, and H. K. Chadwick.
Trans Am Fish Soc. Vol 101, No 3, p 442-452, 1972. Illus.
Identifiers: Abundance, *Bass (Striped), *California, Distribution, Estuaries, Morone-saxatilis, Rivers, *Salinity, *San-Joaquin estuary.

Annual distribution and abundance of young-of-the-year striped bass were measured from 1959 to 1970 in the Sacramento-San Joaquin estuary. Annual abundance of young bass in late summer was closely related to the amount of river flow in June-July into the estuary ($r \pm 0.89$). Highly significant correlations existed between striped bass abundance and salinity and water diverted from the estuary, both of which were mutually related to the amount of river flow. Six mechanisms which may control these relationships are discussed. Annual striped bass distribution in the estuary was also related to river flow ($r \pm -0.93$) and salinity ($r \pm 0.88$) with bass being farther upstream in years of low runoff and high salinity.--Copyright 1973, Biological Abstracts, Inc.
W73-09568

CIRCULATION AND BENTHIC CHARACTERIZATION STUDIES--ESCAMBIA BAY, FLORIDA.
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05B.
W73-09592

A REPORT ON THE PROTOTYPE CURRENT VELOCITY AND SALINITY DATA COLLECTED IN THE UPPER CHESAPEAKE BAY FOR THE CHESAPEAKE BAY MODEL STUDY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. C. Klepper.
Chesapeake Bay Institute Special Report 27 (Reference 72-12), Johns Hopkins University, December 1972. 44 p, 10 fig, 6 tab, 2 ref, 6 append. Contracts DACW31-70-C-0078 and DACW31-70-C-0077.

Descriptors: *Estuaries, *Chesapeake Bay, *Saline water intrusion, *Currents (Water), Flow measurement, Current meters, Velocity, Salinity, Sampling, Boats, Analytical techniques, Data collections, Hydrologic data, Tidal effects.

This report describes current velocity and salinity data collected in the Upper Chesapeake Bay during the Chesapeake Bay Model Study by the Chesapeake Biological Laboratory, Natural Resources Institute, of the University of Maryland and by the Chesapeake Bay Institute of The Johns Hopkins University. The joint field program consisted of same slack salinity runs from January 1971 through December 1972 and four five-day deployments. The same slack salinity runs were made each month along the main channel of the Bay to the upper limit of intrusion of sea-derived salinity. The 1381 Braincon histogram current meter was used to obtain current velocity measurements. Salinity measurements were made with CBI Induction Conductivity Temperature Indicators and Beckman RS-5-3 Industrial Salinometers. A 7094/1401 IBM computer was used to tabulate these data into a useable format. (Woodard-USGS)
W73-09595

SEA GRANT NEWSLETTER INDEX, 1968-71,
Rhode Island Univ., Narragansett. Pell Marine Science Library.
P. K. Weedman, S. Scott, and R. E. Bunker.
Available from NTIS Springfield, Va 22151 Com-72 11479, Price $3.00 printed copy; $0.95 microfiche. National Oceanic and Atmospheric Administration Technical Memorandum EDS ESIC-6, September 1972. 83 p, 1 fig, 4 tab. NOAA 2-35473.

Descriptors: *Oceanography, *Estuaries, *Publications, *Documentation, *Information retrieval, Indexing, Marine fish, Marine biology, Marine geology, Marine microorganisms, Marine plants, Marine animals, Ecology.
Identifiers: *Marine resources.

The Sea Grant Newsletter Index contains all issues of newsletters that have been produced with Sea Grant support, received by the National Sea Grant Depository (NSGD), and dated 1971 or earlier. Most of the articles in the newsletter are indexed. Some exceptions are those that merely list new publications or describe future meetings. In addition, continuing features which contain the same type of information in each issue are only indexed the first time they appear. An indication of this will be found in the notes line of the entry in the document listing. The listing is in alphanumeric order by document number. All available bibliographic information for each newsletter is given. The entries for the individual newsletter articles are brief, normally consisting of document number, date, title, and citation. If other information, such as personal author and author affiliation, is available or comments are needed, these are included. (Woodard-USGS)
W73-09598

TIDAL DATUM PLANES AND TIDAL BOUNDARIES AND THEIR USE AS LEGAL BOUNDA-

RIES -- A STUDY WITH RECOMMENDATIONS FOR VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
J. D. Boon, III, and M. P. Lynch.
Available from NTIS, Springfield, Va 22151 PB-212 699 Price $3.00 printed copy; 95 cents microfiche. Virginia Institute of Marine Science Special Report No 22, January 1972. 61 p, 12 fig, 1 tab, 13 ref, 1 append.

Descriptors: *Tides, *Water levels, *Ocean waves, *Oceanography, *Virginia, Bays, Estuaries, Tidal effects, Coasts, Tidal marshes, Currents (Water), Boundaries (Property), Legal aspects, High water mark, Low water mark.
Identifiers: *Tidal datum, Tidal boundaries.

The almost 400,000 acres of wetlands located along the more than 5,000 miles of Virginia's coastline form a unique natural resource of the commonwealth. Illustrated data include schematic view of earth, moon, and tidal bulges; schematic view of earth, moon, and their respective orbital planes in relation to the earth's axis and equatorial plane; relationship between mean tide level, mean high water, mean low water and the sea level datum of 1929 along the James River estuary in Virginia; mean range in feet, Chesapeake Bay (after Hicks, 1965); tide curve, Gloucester Point, Virginia, July, 1970; monthly mean low water, Wachapreague, Virginia, November 1969 - December 1970; yearly sea level, Atlantic coast (after Marmer, 1951); difference between yearly low water and yearly sea level plotted against time in years (after Marmer, 1951); simultaneous comparison at low water; tidal datum planes intersecting shore; diagram showing three possible low-water marks, given mean low water, by erosion, no change, or accretion; and aerial photograph of a marsh creek showing areas below mean high water and proposed wetlands boundary. (Woodard-USGS)
W73-09609

AN ECONOMIC APPROACH TO LAND AND WATER RESOURCE MANAGEMENT: A REPORT ON THE PUGET SOUND STUDY,
Washington Univ., Seattle. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-09646

CYCLING OF ELEMENTS IN ESTUARIES,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 05B.
W73-09647

UNSTRUCTURED MARINE FOOD WEBS AND 'POLLUTANT ANALOGUES',
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-09649

ENVIRONMENTAL ASPECTS OF DREDGING IN ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05C.
W73-09651

HYDROLOGICAL OBSERVATIONS IN THE BAY OF MARSEILLE (1961 TO 1965), (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d;Endoume.
H. J. Minas.
Tethys. Vol 3 No 3, p 447-457. 1971 (1972). Illus. English summary.
Identifiers: Bays, *France, Hydrological studies, *Marseille (Bay), Oxygen, Salinity, Water temperature.

Results of hydrological investigations (temperature, salinity, O2) from 1961 to 1965 in the Bay of Marseilles are discussed. The most frequently observed salinity is about 37.9% and it alternates with a salinity higher than 38%. The latter can be explained by the vertical mixing in winter and by the upwelling of subsurface water. Slight dilutions of surface water are clearly more frequent than rare strong dilutions due to the influence of the Rhone riverwater. Hydrological features show a strong vertical mixing in winter. Average values of the summer temperatures can be expected to be the lowest of Mediterranean coasts. This must be explained by the upwelling of subsurface water induced by strong N-W winds (Mistral). At the end of summer a thermocline at 50 m depth separates an upper layer of warm water with salinity (S%>38) from a deeper layer, which shows a salinity minimum and an O2 maximum in its upper part. Hydrological conditions are very similar to those observed in Villefranche-sur-Mer. The principal difference between the 2 regions is a more important cooling of coastal water near Marseilles by strong winds from the N-W; this cooling is also favored by the continental shelf.--Copyright 1972, Biological Abstracts, Inc.
W73-09690

MESOBENTHIC COMPLEXES IN THE BAYS OF THE KILIYAN DELTA OF THE DANUBE, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Hidrobiologii.
M. N. Dekhtyar.
Gidrobiol Zh. Vol 8, No 1, p 44-49, 1972. Illus. English summary.
Identifiers: Bays, *Benthos, *Danube River, *Deltas, Fauna, Kiliyan delta, Salinity, USSR.

Five mesobenthic found complexes are described on different grounds of the Danube delta. The dependence of their formation on the salinity value frequency and range of variations is shown. These complexes preserve the typical structure of the delta under unstable conditions because of their ecological heterogeneity.--Copyright 1972, Biological Abstracts, Inc.
W73-09703

PROTECTING AMERICA'S ESTUARIES: PUGET SOUND AND THE STRAITS OF GEORGIA AND JUAN DE FUCA.
For primary bibliographic entry see Field 06E.
W73-09712

PROTECTING AMERICA'S ESTUARIES: PUGET SOUND AND THE STRAITS OF GEORGIA AND JUAN DE FUCA (20TH REPORT).
For primary bibliographic entry see Field 06E.
W73-09713

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

A TRANSPORT MECHANISM IN HOLLOW NYLON FIBER REVERSE OSMOSIS MEMBRANES FOR THE REMOVAL OF DDT AND ALDRIN FROM WATER,
Tennessee State Univ., Nashville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-09302

THERMAL REGENERATION ION EXCHANGE PROCESS WITH TRIALLYLAMINE POLYMERS,
ICA Australia Ltd., Melbourne. (Assigne).
H. A. J. Battaerd.
U. S. Patent No. 3,716,481, 10 p, 7 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 907, No 2, p 480, February 13, 1973.

Descriptors: *Patents, *Demineralization, *Polymers, Water quality control, Chemical reactions, *Radiation, *Ion exchange, Desalination, Waste water treatment.
Identifiers: Triallylamine polymers.

Experimental results and tabulated data are given to illustrate the process set forth in this disclosure. It sets forth the process for the demineralization of water by a mixed bed of weak acid and weak base type ion exchange resins in which the mixed bed is regenerated by eluting it with water or a saline solution at a temperature exceeding that used during the adsorption stage. The weak base resin is at least one solid polymer comprising 3 and 100 mole percent of triallylamine and a balance of at least one allylamine comer. The polymer used is prepared by exposing the allylic monomer or monomers to a total dose of from 3 to 20 megarads of high enerby radiation at a temperature between -80 degC and+12 degC. (Sinha-OEIS)
W73-09386

ION EXCHANGE DEMINERALIZING SYSTEM,
CCI Aerospace Corp., Van Nuys, Calif. (Assignee).
A. M. Johnson.
U. S. Patent No 3,715,287, 7 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 172, February 6, 1973.

Descriptors: *Patents, *Demineralization, *Desalination, *Ion exchange, *Resins, Carbon, Salt, Salinity, Anion exchange, Cation exchange, Separation techniques, Water purification, Water quality control, *Waste water treatment.

This water treatment system consists of a preconditioner unit and a salinity buffer-storage tank unit which can be used separately or in a combination, and also in conjuntion with a demineralizing unit. The preconditioner unit consists of two containers which operate in push-pull arrangement. These tanks contain strong acid resins arranged with one in service to soften the raw incoming water and one in regeneration, short duty cycles. A combination storage tank-salinity buffer is provided for use with a demineralization system. This tank contains a mixture of anion responsive carbon particles and cation responsive carbon particles. These act as a buffer. The extent of salt take-up by the carbons is a function of the saltiness of the surrounding water in the storage tank, which receives water from the demineralizer unit. (Sinha-OEIS)
W73-09395

TUBULAR OSMOTIC MEMBRANE,
E. A. G. Hamer.
U. S. Patent No 3,715,036, 5 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 110, February 6, 1973.

Descriptors: *Patents, *Desalination apparatus, *Reverse osmosis, *Membranes, Equipment, Separation techniques.

This invention relates to osmotic membranes in a tubular form rendering them particularly useful as components in desalination apparatus and to methods for preparing such tubular membranes. The membrane is formed from a flat membrane which is curled and lap seamed. An adhesive is employed to seal the lap seam. The adhesive does not permanently bond together the lapped surfaces of the membrane until after the membrane is positioned in contact with the support tube and fluid pressure is applied to force the membrane into firm and conforming contact with the support member. (Sinha-OEIS)
W73-09396

VAPOR FREEZING TYPE DESALINATION METHOD AND APPARATUS,
Pacific Lighting Service Co., Los Angeles, Calif. (assignee)
R. E. Peck.
U. S. Patent No. 3,714,791, 6 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 44, February 6, 1973.

Descriptors: *Patents, *Desalination, *Evaporation, Heat exchangers, *Flash distillation, Sea water, Potable water, Equipment, Saling water, *Condensation, Brine.
Identifiers: *Vacuum freezing.

Cooled sea water is introduced into a low pressure chamber to form water vapor, ice, and cold brine. In the first step of this batch-type process there is a continous freezing of water vapor to form ice in a second chamber. In the second step relatively warmer sea water is introduced into a low pressure region to form water vapor and cold brine. The resulting water vapor is contacted with ice from the previous operation for condensing the water vapor and melting the ice. The apparatus comprises a vacuum freezing chamber, a spray nozzle near its upper portion and at its bottom a conduit controlled by a valve to lead brine from this chamber through a heat exchanger. A screen near the bottom of the chamber retains the ice formed in it. There is also provided a condensation chamber that is connected to the vacuum freezing chamber by means of a vapor conduit. This chamber contains refrigeration tubes that cause condensation of the water vapor. The refrigerant may be liquified natural gas or cold natural gas. After passing through the refrigeration tubes, the natural gas passes to an expansion turbine where the expansion produces a substantial amount of shaft horsepower used in the pumps needed in the operation. In the evaporation chamber, incoming seawater is flash evaporated and the resultant brine somewhat cooled and discharged. The water vapor formed here flows into the condensation and vacuum freezing chambers. (Sinha-OEIS)
W73-09402

FLASH EVAPORATOR,
P. R. Bom.
U. S. Patent No 3,713,989, 3 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 906, No 5, p 1711, January 30, 1973.

Descriptors: *Patents, *Flash distillation, Separation techniques, *Evaporators, *Distillation, *Water treatment, *Water purification, Water quality control, *Desalination.

The flash evaporator consists of an elongated vessel divided by partitions into a series of connected chambers. Cold raw water to be preheated is conveyed in cooling pipes successively through the vapor condensing portions of the chamber and then flashed in reversed flow through. The vapors which result are condensed and fall into a receptacle in each chamber. An exterior chamber is longitudinally divided into compartments by transverse partitions. A hood in each chamber has an opening over each receptacle to form a collecting space for non-condensable gases which may be present in the vapor. The non-condensable gases are removed from closed channels by a special conduit. It is possible to put one chamber out of operation for maintenance and repairs without interrupting the entire operation. (Sinha-OEIS)
W73-09404

GEOTHERMAL RESOURSE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: DEVELOPMENTAL CONCEPTS.
Bureau of Reclamation, Washington, D.C.

January 1972. 58 p, 2 fig, 12 plate, 3 photo, 4 tab.

Descriptors: *Desalination, *Geothermal studies, *Water purification, *Thermal water, *California, Methodology, Steam, Groundwater, Surface water, Imported water, Injection wells, Subsidence, Water supply, Water quality, Costs, Electric power, Planning, Water utilization.
Identifiers: *Imperial Valley (Calif).

This report describes the need for augmenting the Colorado River with high quality water, and shows how the hot geothermal brines of the Imperial Valley, California, could be used to supply this need through multipurpose development of the resource. The hot brine will flash into a mixture of steam and brine when pressures are relieved by a well. This mixture will flow to the surface and can be used to produce not only electric power, but also desalted water and possibly mineral by-products. The program would be developed in three stages. The Research and Development Stage would, through extensive geological, geophysical, and water chemistry investigations, determine the potential and extent of the geothermal resource. This program would require expenditures of about $16 million over a 7-year period. The Demonstration Stage would demonstrate the feasibility of large-scale development. The concept would use a local salt or brackish water supply for replacement fluids such as Salton Sea, Wellton-Mohawk Drain, or groundwater. The magnitude of the development would be about 100,000 acre-feet of fresh water per year and about 400-500 megawatts of electric power. Cost of desalted water produced and delivered would range from $85 to $130 per acre-foot and electric energy would be produced at 3 to 5 mills per kwh. The Large-Scale Development Stage would augment the Colorado River by delivering as much as 2.5 million acre-feet of desalted water annually with electric power production of about 10,000 mw. This would require importation of Pacific Ocean or Gulf of California water for replacement fluids. Cost of desalted water produced and delivered would range from $100 to $150 per acre-foot, and electric energy would be produced at 3 to 5 mills per kwh. (Woodard-USGS)
W73-09439

ECONOMIC STUDY OF THE VACUUM FREEZING EJECTOR ABSORPTION DESALTING PROCESS,
Colt Industries, Inc., Beloit, Wis.
J. Koretchko.
Available from the National Technical Information Service as PB-217 616, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 833, July 1972. 162 p, 22 fig, 5 tab, 5 ref, 3 append. 14-30-2988.

Descriptors: *Desalination, Desalination apparatus, Freezing, Economics, *Cost Analysis, Crystallization, Absorption.
Identifiers: *Vacuum freezing.

The work effort consisted of the following: (1) A 1.0 MGD reference desalting plant was designed in sufficient detail to demonstrate plant operability and allow accurate estimating of the capital cost and the water cost. Assuming a power rate of 8.5 mills/Kw-hr, a steam rate of 50 cents/1,000,000 Btu, a fixed charge rate of seven pervent, and a 90 percent plant load factor, the following table shows the cost of desalted water for the 1.0 MGD reference plant as the feed salinity and temperature are varied: Feed Salinity, ppm 5,000, 20,000, 35,000 Feed Temperature, F 60 to 80, 60 to 80, 60 to 80, Water Cost Range, cent/Kgal 63 to 72, 68 to 79, 72 to 84. (2) Nomographs were developed to obtain the minimum water cost for a 1.0 MGD plant with the following parametric ranges: 60 to 80 F feed temperature, 0.5 to 1.2 cents/Kw-hr power rate, 30 to 80 cents/1,000,000 Btu steam rate, 7 to 14% fixed charge rate, 60 to 90% plant load factor, 0.5 to 3.5% feed salinity. For these parametric ranges, the water cost range is 53 to 125 cents/Kgal. (OSW)
W73-09623

POROUS MATERIALS FOR REVERSE OSMOSIS MEMBRANES: THEORY AND EXPERIMENT,
Massachusetts Inst. of Tech., Cambridge.
G. Jacazio, R. F. Probstein, A. A. Sonin, and D. Yung.
Available from the National Technical Information Service as PB-214 972, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 809, December 1972. 43 p, 7 fig, 18 ref. 14-30-2575.

Descriptors: *Desalination, *Membranes, *Porous media, *Pore Radius, *Reverse osmosis.
Identifiers: *Porous membranes, Compacted clay, Debye length, Peclet No., Salt rejection, Zeta potential, Filtration velocity.

A theory is presented for the salt rejecting characteristics of porous membranes, whose pore size is large compared with molecular dimensions, under reverse osmosis conditions where the saline solution is moved through the membrane pores by an applied pressure gradient. The salt rejection mechanism is assumed to be an electrokinetic one resulting from charge built up on the interior surfaces of the material when in contact with the salt solution. The performance of the porous material is shown to depend on three parameters: the ratio of Debye length to effective pore radius; a dimensionless wall potential related to the zeta potential; and a Peclet number based on the filtration velocity through the pore, the membrane thickness and the diffusion coefficient of the salt in the water. A universal correlation is given for the fractional salt rejection in terms of the three membrane parameters. Experiments were carried out on the salt rejecting properties of compacted clay, through which saline solutions were forced under high pressures. Absolute comparisons between the experimentally determined and theoretically predicted rejection characteristics are shown to be excellent. A comparison of the theory with experimental data of Michelsen and Harriott on cellophane also shows very good agreement. (OSW)
W73-09624

EVAPORATION OF WATER FROM AQUEOUS INTERFACES,
Rochester Inst. of Tech., N.Y.
K. Hickman, I. White, and W. Kayser.
Available from the National Technical Information Service as PB-215 184, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 808, April, 1972. 110 p, 39 fig, 9 tab, 48 ref. 14-30-2572.

Descriptors: *Air-water interface, *Condensation, *Mass transfer, *Evaporation, *Boule flotation, *Desalination, Distillation, Films Surfaces.
Identifiers: Surface purification, Transfer coefficients.

The effects of trace contaminants on the thermal properties of superheated water were measured. When water covered by steam is maintained at the boiling point, it super-heats to a consistent value for a given input of additional heat energy. This value was lowest for the purest water and increased when trace amounts of long chain organic substances were added. Typifying the additives, cis-12-docosenoic acid (erucic) and n-tetracosenoic acid (lignoceric) gave a significant (11%) increase in superheat when one molecule of fatty acid was supplied for each 4600 A2 of exposed water surface. With 25 times the quantity, i.e., 1 molecule for each 180A2 of water surface, a limiting increase of 40% - 47% was attained. Suppression of evaporation appears to be due to stabilization of the sub-surface, which prevents evaporatively cooled layers descending, rather than to a reduction of molecular permeability to steam. Experiments were also carried out on the schizoid

surface, i.e., the separation of an evaporating liquid surface into two distinct boiling modes, one surface seething rapidly, the other scarcely at all. In addition measurements are reported on the electrical conductivity of water near the normal boiling point. (OSW)
W73-09625

DEVELOPMENT OF IMPROVED POROUS SUPPORT FOR REVERSE OSMOSIS MEMBRANES,
Uniroyal, Inc., Wayne, N.J.
H. P. Smith, and K. K. Sirkar.
Available from the National Technical Information Service as PB-215 077, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 807, December, 1972. 55 p, 17 tab, 4 fig, 3 ref. 14-30-2564.

Descriptors: *Reverse Osmosis, *Membranes, Permeability, *Desalination, Tensile strength, Compressive strength, Heat treatment, Permselective membranes.
Identifiers: *Membrane support, *Porous polyethylene, *Flux, *Salt rejection, Braided wire reinforcement, Extrusion of tublar support.

The composite support that evolved from the contract work consists of a porous polyethylene tube with an external braid of stainless steel wire. The porous tube is made by mixing powdered polyethylene and plasticized polyethylene oxide, extruding the compound on a mandrel in the form of a tube, wrapping the tube with a braid of stainless steel wire, sintering the tube, removing the mandrel, and extracting the polyethylene oxide to leave open pores in the polyethylene. After application of end fittings, a membrane is inserted to form the complete desalination unit. A composite support of 1/2 inch inside diameter containing a CA membrane heat treated in situ was subjected to desalination testing at pressures of 275, 600, 700, 900, 1200 and 1500 psi. Salt rejection and water flow were measured. At 1500 psi the flow was 7.7 GFD with 53.6% salt rejection. When the pressure was dropped back to 300 psi, flow and salt rejection returned to approximately the same values observed at that pressure previously, i.e., before using the elevated pressures. It is concluded that there was no gross damage to the membrane in the test of the reinforced support. It is difficult to conclude how much of the non-ideal behavior of the composite is due to deficiencies in the membrane itself. (OSW)
W73-09626

ANNUAL REPORT (FY 1971) WEBSTER TEST FACILITY AND ELECTRODIALYSIS TEST--BED PLANT, WEBSTER, SOUTH DAKOTA,
Mason-Rust, Lexington, Ky.
J. S. Nordin, N. Call, R. A. Ackerman, D. R. Bogue, and J. E. Gugeler.
Available from the National Technical Information Service as PB-215 183, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 805, February, 1972. 130 p, 20 fig, 23 tab, 11 ref. 14-01-0001-2263.

Descriptors: *Electrodialysis, *Desalination, Economics, *Brackish water, *Water purification, South Dakota, Potable water.

The Asahi Chemical Industry (ACI)-designed Test Bed Plant completed its ninth year of operation as the only Office of Saline Water Test Bed Plant for converting brackish water to potable water by the electrodialysis process. The plant has a production capacity of 325,000 gallons per day. Since May 1969, the feed water has been pretreated using lime softening to reduce the level of iron, maganese, and hardness. During FY 70, the performance of the Test Bed Plant was evaluated on the basis of anion membranes subject to organic fouling, using carbon filtration pretreatment for feed water organic removal to compensate for the anion fouling. The major goal during this report period was to evaluate performance of the Test Bed Plant using an organic foulant-resistant membrane without carbon pretreatment. The membrane combination tested was the Tokuyama Soda Company, Ltd. (Japan) AF-4T anion and CH-2T cation permeable membranes. These membranes were chosen on the basis of successful pilot plant results completed in FY 1970. (OSW)
W73-09627

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALTING PLANTS (PART III - NUMERICAL SIMULATION AND DESIGN CONSIDERATIONS),
Dow Chemical Co., Freeport, Tex.
For primary bibliographic entry see Field 05E.
W73-09628

A STUDY OF THE EFFECT OF DESALINATION PLANT EFFLUENTS ON MARINE BENTHIC ORGANISMS,
Dow Chemical Co., Freeport, Tex.
E. F. Mandelli, and W. F. McIlhenny.
Available from the National Technical Information Service as PB-215 182, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 803, October, 1971. 154 p, 56 tab, 30 fig, 64 ref. 14-01-0001-2253.

Descriptors: *Brine disposal, Discharge (Water), *Desalination plants, *Copper, *Benthos, Copper compounds, Thermal stress, Salinity, Marine animals, Marine fish, Shrimp, Oysters, Effluents, Toxicity, Larvae.
Identifiers: *Marine benthic organism.

The objective was to determine the effects of increased salinities, temperatures and copper concentrations on marine benthic organisms as a result of desalination brine disposal into coastal and estuarine environments. In order to evaluate the effects of the seawater-brine mixtures on typical benthic fauna, the American oyster, Crassostrea virginica (Gmelin) and the penaeid shrimps, Penaeus aztecus (Ives) and Penaeus duorarum (Burkenroad), were selected and long-term multivariate, seasonal experiments on juvenile and adult speciments were conducted. The effects of the mixtures of brine and seawater were also tested on the eggs and larval stages of these marine benthic organisms, using short-term bioassay tests. Seawater-brine dilutions containing 0.02 ppm of total copper (with about 0.01 ppm present as ionic copper) had an acute toxic effect on C. virginica larvae. The mixture was also harmful to juvenile and adult specimens due to the copper accumulation in their tissues that impaired the metabolic functions of the organism and lowered the tolerance level to other environmental stresses. With normal copper concentrations for seawater, an increase of temperature of salinity to 10 percent above the environmental values enhanced the incidence level of the pathogenic fungus, Labyrinthomyxa marina, letha to adult oysters. Penaeid shrimp exhibited a greater tolerance to the presence of the desalination brine in the coastal seawater. Larval stages of shrimp were able to develop normally in the presence of 0.025 ppm of dissolved copper, at salinities up to 35,000 ppm and temperatures of 81.5F. A copper concentration of 0.05 ppm in the seawater-brine mixtures was lethal to the nauplial, protozeal and mysis stages of P. aztecus and P. duorarum. (OSW)
W73-09629

A PROGRAMMED INDIRECT FREEZING PROCESS WITH IN-SITU WASHING AND IN--SITU MELTING OPERATIONS,
Denver Research Inst., Colo.
Chen-yen Cheng, Gary Van Riper, and V. Grant Fox.
Available from the National Technical Information Service as PB-215 181, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 802, December 1972. 59 p, 34 fig, 4 ref, 2 tab. 14-30-2526.

Descriptors: *Desalination, *Freezing, *Ice, Crystallization.
Identifiers: Indirect freeze desalination.

A programmed indirect freezing process with the following features has been studied: (1) It is a cyclic process to be conducted in a unified freezer-melter and each cycle consists of a feeding step, a freezing step, an in-situ washing step and an in-situ melting step. Because of the in-situ washing and in-situ melting steps, problems associated with scraping of ice and transfer of ice have been eliminated. (2) By an appropriate coordination of the design of a unified freezer-melter and the control of the freezing step, a consolidated ice bed of a structure similar to that of a hydraulic ice washing column used in a direct contact freezing process is obtained at the end of each freezing step. Therefore, an efficient washing of ice bed can be accomplished with a small loss of wash water. (3) New ways of accomplishing heat reuse, such as the use of a working medium which undergoes solid equal liquid transformations and the method based on low pressure freezing and high pressure melting operations, have been incorporated in the process to significantly reduce the energy requirement. (OSW)
W73-09630

DEVELOPMENT OF LOW COST, CORROSION RESISTANT ALLOYS AND OF ELECTROCHEMICAL TECHNIQUES FOR THEIR PROTECTION IN DESALINATION SYSTEMS,
Tyco Labs., Inc., Waltham, Mass.
For primary bibliographic entry see Field 08G.
W73-09631

MODIFIED POLYOLEFIN MEMBRANES FOR USE IN REVERSE OSMOSIS OR PRESSURE DIALYSIS,
Southwest Research Inst., San Antonio, Tex.
H. F. Hamil.
Available from the National Technical Information Service as PB-215 180, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 800, July 1972. 45 p, 19 tab. 14-30-2719.

Descriptors: *Membranes, *Reverse osmosis, *Ion transport, Cation Exchange, Anion exchange, Permeability, *Desalination, Polyelectrolytes.
Identifiers: *Polyolefin membranes, Pressure dialysis, Mosaic membranes, Grafting, Polysalt membranes, Hydrophilic membranes.

Preparation of crude mosaic membranes by selective areal grafting of acidic and basic monomers onto polyethylene film was accomplished. Preparative procedures evaluated included direct grafting, indirect grafting, and peroxidation grafting using gamma irradiation, beta irradiation, and both high and low energy electrons. The peroxidation technique using electron irradiation was most successful. A better procedure for mosaic membrane preparation involved chemical addition of cationic and anionic sites to a styrene grafted polyethylene film using a masking technique to obtain the desired control of charge domain size and spacing. Efforts to prepare neutral hydrophilic membranes by irradiation grafting of polyethylene film with hydrophilic monomers failed to give membranes with acceptable reverse osmosis characteristics. Preparation of random polysalt membranes by sequential grafting of polyethylene with acid and basic monemers afforded membranes which displayed selective transport porperties for different ions when evaluated with mixed ionic species in the feed. (OSW)
W73-09632

FREEZING PROCESS STUDIES: ANISOTROPIC ICE BEDS, BUTANE FLASHING, AND BUTANE BOILING,
Syracuse Univ., N.Y. Dept. of Chemical Engineering and Materials Science.
J. S. Huang, A. V. Naimpally, Y. F. Rmissirlis, P. A. Rice, and A. J. Barduhn.
Available from the National Technical Information Service as PB-215 178, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 797, December 1972. 126 p, 30 fig, 15 tab, 64 ref. 14-30-2578.

Descriptors: *Desalination, *Freezing, *Ice, *Crystallization, Permeability.
Identifiers: *Anisotropy, *Ice beds, Butane.

This report covers research on subjects: Anisotropy in Beds of Ice Crystals, Removal of Dissolved Butane from Water by Vacuum Flashing, and the Rate of Evaporation of Butane Droplets Suspended in Water. Ice beds tested showed 'apparent' anisotropy in which the effective ratio of horizontal to vertical permeability was about 1.2. It is also shown that the effect on wash column design of increased ratio (horizontal/vertical) permeability is to decrease the slurry pumping cost slightly and to give more operating flexibility by lowering the brine crown height. It does not increase the capacity of the column to wash ice, however. Experimental and mathematical analysis of vacuum flashing of butane from water solutions is reported. One model assumed the drop completely mixed with the entire resistance to the butane evaporation residing in the gas phase. Experimental evaporation rates were much slower than predicted by this mixed drop model. The second model assumed no gas phase resistance and the drop to be stagnant with liquid diffusion controlling. The experimental rates were much higher than predicted by this stagnant drop model. A model with internal drop circulation was not attempted but has a better chance of agreeing with the experimental data. The first stages of evaporation of a butane drop formed beneath the tip of a vertical capillary tube submerged in warm water were observed by cinematography and the rates of evaporation, areas, delta T driving forces, and heat transfer coefficients were measured as a function of time. The process was observed until 1% of the drop was evaporated. Bubble growth rates varied as the square root of time and heat transfer coefficients were as large as 200 to 1400 kcal/ (cm2hr. deg C) depending on delta T. Lower heat ransfer coefficients corresponded to higher delta T's. (OSW)
W73-09633

NEW BORON-NITROGEN POLYIONS AND RELATED COMPOUNDS FOR ION EXCHANGE,
Texas Christian Univ., Fort Worth.
H. C. Kelly.
Available from the National Technical Information Service as PB-215 177, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 794, September, 1972. 10 p, 2 tab, 7 ref. 14-01-0001-2175.

Descriptors: *Ion exchange, *Anion exchange, *Desalination, Ions, Salts, Boron, *Electrolysis.
Identifiers: *Boron-nitrogen polyions.

Both heterogeneous nucleophilic displacement and vinyl polymerization have proven successful as routes for the synthesis of salts of boron containing cations and polymeric boron (n+) ion salts. Although the study was limited in the number of electrolytic species synthesized, the potential for synthesis is great and a wide variety of cationic species are possible through both preparative routes. In general, the products obtained are high melting and relatively chemically inert. The question of water solubility is of primary consideration for any potential application of such boron cation salts as membrane components. It has been found that iodide salts of the cations have a high solubility in aqueous media, however, relatively insoluble derivatives can be obtained in the form of hexafluorophosphate, tetraphenylborate or other salts. Even if halide salts should generally be found to exhibit significant solubility it is feasible that they could be incorporated into an appropriate matrix in a membrane permitting utilization of the cationic system for anion exchange. A study of the evaluation of such species as potential components of ion exchange membranes was not within the scope of the study. (OSW)
W73-09634

EFFECT OF TURBULENCE PROMOTERS ON LOCAL MASS TRANSFER - SECOND REPORT,
Ionics, Inc., Watertown, Mass.
L. Marincic, and F. B. Leitz.
Availablefrom the National Technical Information Service as PB-215 176, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 793, July 1972. 150 p, 112 fig, 6 tab, 4 ref. 14-01-0001-2174.

Descriptors: Desalination, *Turbulence, Reynolds number, *Electrodialysis, Laminar flow, *Mass transfer.
Identifiers: *Turbulence promoters, Segmented electrode, Polarization.

An instrument has been developed for detailed measurement of mass transport in channels similar to those in electrodialysis equipment. Mass transport promoters are commonly used to increase the usable current density. The final objective of this investigation is the development of techniques for optimization of such promoters. The apparatus consists of an electrochemical cell containing a segmented cathode, which is so connected that current through each segment can be measured separately. The aggregate of these measurement provides a mass transfer profile over the surface of this cathode. To test the apparatus, runs were made under conditions which matched as closely as possible the conditions for which a mathematical solution to the mass transfer equations could be obtained. The conditions selected were well developed laminar flow in a rectangular channel of constant cross-section with the concentration gradient beginning at the leading edge of the electrode. The channel width was 25 times the channel height and data only from the middle portion of the channel were used so this could reasonably be compared to flow between parallel plates of infinite width. The data yielded a diffusion constant which correlated closely to values reported in the literature. A full investigation was made of single rectangular, circular, and triangular turbulence promoters placed against both polarized and nonpolarized surfaces. Reynolds number ranged across most of the laminar flow region. The data thus obtained made it possible to construct a unified picture of flow and mass transfer with each promoter. Each promoter shape has its own characteristics. These data show an unexpected phenomenon. Ahead of the rectangular promoter, when it is placed against the polarized surface, the current density reaches a minimum about 10% below the unpromoted value. This minimum was observed in all runs with a promoter having a bluff leading edge and is apparently caused by pulling away of the streamlines from the polarized surface in a region where current passes unimpeded through the solution. This behavior is not observed with the triangular promoter or with promoters in other locations. (OSW)
W73-09635

SYNTHESIS OF BLOCK POLYMERS,
Iowa Univ., Iowa City.
J. K. Stille, M. Kamachi, and M. Kurihara.
Available from the National Technical Information Service as PB-215 172, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 792, February 1972. 81 p, 43 fig, 9 tab, 26 ref. 14-01-0001-2157.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, Permeability, Cation exchange, Anion exchange.
Identifiers: *Block copolymers, *Polymerization, Pressure dialysis, 'Living' polymers, Salt rejection, Polymer properties, Film forming polymers.

Block copolymers of 2-vinylpyridine and various methacrylic and acid esters were synthesized by 'living' anionic polymerization at low temperature. Block copolymers having uniform block lengths of controlled molecular weight and with a narrow molecular weight distribution were prepared by this method. Base hydrolysis of the ester sequence produced the block copolymer of 2-vinylpyridine and methacrylic acid. Quaternization of the 2-vinylpridine block followed by dehydrohalogenation yields a polymer containing anionic and cationic blocks. The physical properties and salt rejection of these polymers has also been studied. (OSW)
W73-09636

THE USE OF POLYMERIC GELS TO REDUCE COMPACTION IN CELLULOSE ACETATE REVERSE OSMOSIS MEMBRANES,
Carnegie-Mellon Univ., Pittsburg, Pa.
S. L. Rosen, C. Irani, and L. Baayens.
Available from the National Technical Information Service as PB-215 175, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 791, December 1972. 43 p, 15 fig, 17 tab. 14-01-0001-2125.

Descriptors: *Reverse osmosis, *Membranes, *Compaction, Permeability, Saline water, Pressure, *Desalination.
Identifiers: *Cellulose acetate membranes, Crosslinking, Polymeric gels, Flux decline, Salt rejection, Flux, Emulsion gels, Solution gels, Membrane hydrodynamics.

Polymeric gels were synthesized by crosslinking cellulose acetate in emulsion and solution reactions. These gels were used to replace a portion of the linear cellulose acetate in a standard Manjikian-type asymmetric membrane, with the aim of reducing long-term flux decline. Membranes were tested on a 3.5% NaCl solution at 1500 psi for up to 400 hours. The solution polymerization technique was capable of producing a wide range of gel characteristics. Appropriate solution polymerized gels reduced the compaction slope by about a factor of two, without seriously comprising salt rejections, and by casting somewhat thinner membranes, the fluxes could be maintained at the control level. Experiments on a series of dense cellulose acetate membranes of different thickness revealed that essentially all the hydrodynamic resistance in an asymmetric membrane is in the dense, salt-rejecting layer, and further indicate that this is the locus of flux decline processes. (OSW)
W73-09637

DEVELOPMENT OF HOLLOW FINE FIBER REVERSE OSMOSIS DESALINATION SYSTEMS,
Monsanto Research Corp., Durham, N.C.
T. A. Orofino.
Available from the National Technical Information Service as PB-215 179, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 789, April 1972. 82 p, 18 fig, 40 tab, 7 ref. 14-30-2585.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, Membrane process, Hollow fibers, *Desalination apparatus.
Identifiers: *Fiber Bundles, Laminar-Flow hydrodynamics.

Basic procedures for preparation of hollow fibers established in previous work were further extended and utilized in construction of demonstration modules. Performance of the low-pressure cellulose acetate hollow fiber system describe in OSW Research and Development Progress Report No. 549 was considerably improved and translation of the preparative technique to multi-orifice spinning was demonstrated. Typical performance indices for members of this hollow fiber system are 5 gfd with 90% rejection and 3 gpd with 97% rejection, obtained with 3000 ppm sodium chloride feed at 70 deg F, 250 psi external pressure, and zero recovery. Appropriate techniques for assembly of large fiber bundles and fabrication of high pressure seals were developed. Together with results from investigations of fiber bundle hydraulics, these techniques were utilized in design, construction, and field testing of several 300 gpd and 1400 gpd reverse osmosis units incorporating the high-performance cellulose acetate fibers. Continued field testing of the 100 gpd Webster, South Dakota units (380days) established excellent stability of fiber properties. (OSW)
W73-09638

PREPARATION AND PROPERTIES OF GRAFTED MEMBRANES FOR DESALINATION,
North Carolina State Univ., Raleigh.
V. T. Stannett, H. B. Hopfenberg, and F. Kimura-Yeh.
Available from the National Technical Information Service as PB-215 174, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 788, August 1971. 140 p, 48 tab, 47 fig. 14-01-0001-1461.

Descriptors: *Membrnes, *Reverse osmosis, *Desalination, Permeability, Ion transport.
Identifiers: *Polymer grafting, Cellulose acetate-styrene graft copolymers, Salt rejection, Flux, Compaction resistance.

A number of relevant parameters of the grafting system cellulose acetate-styrene were correlated with the resultant product flux, salt rejection, compaction, and tensile creep properties of the various grafted membranes prepared by novel, radiation initiated processes. The parameters studied include cellulose acetate, state of aggregation (film or solution); film thickness; film asymmetry; radiation dose; dose rate; swelling agent, type and concentration; multifunctional monomer concentration, and order of processing steps. Long chain grafts exhibited markedly reduced tensile creep rates, comparable normalized flux and rejection, and improved compaction resistance compared with ungrafted cellulose acetate. To date, the membranes have not been formulated with sufficient asymmetry to exhibit absolute fluxes in the range of ungrafted cellulose acetate. Short chain grafts exhibited normalized product fluxes which increased monotonically with percent graft although the salt rejection remained constant (>99%) up to 40% graft; salt rejection decreased rapidly with increasing grafting in excess of 40%. Tensile creep was virtually eliminated by short chain grafting of ca. 35%. A study of comparable scope involving methyl methacrylate grafting to cellulose acetate was conducted. Vapor phase grafting as well as heterogeneous liquid-solid grafting was employed. Grafting in the presence of multifunctional monomers produced membranes with significantly improved compaction resistance. Grafting to porous membranes was investigated from two standpoints. Styrene was grafted to cellulosic Millipore support membranes to stabilize the flux through composites prepared from these orous structures and ultrathin barrier membranes. Alternatively, rather hydrophobic,porous supports such as poly (vinylchloride) and polyethylene were grafted with polyelectrolytes such as acrylic acid and 2-vinyl pyridine and its quaternized form in an attempt to fill the pores with extremely permeable, albeit selective, gel. The final phase of the work involved the extension of the grafting technology to other base polymer systems. Acrylic acid, ethylacrylate, and 2-vinyl pyridine were grafted to poly (vinylchloride) films. (OSW)
W73-09639

HYPERFILTRATION IN POLYELECTROLYTE MEMBRANES,
Weizmann Inst., of Science, Rehoveth (Israel).
D. Vofsi, and O. Kedem.
Available from the National Technical Information Service as PB-215 173, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 787, December 1972. 36 p, 9 tab, 6 fig, 10 ref. 14-01-0001-961.

Descriptors: *Reverse osmosis, *Membranes, *Permeability, *Ions, Ion transport, Desalination.
Identifiers: *Hyperfiltration, *Polyelectrolyte membranes, Salt rejection, Charged membranes, Streaming potential, Asymmetric membranes, Maleinated acetyl-cellulose, TMS model.

Hyperfiltration (Reverse osmosis) research in the following areas is reported: asymmetric membranes prepared from maleinated acetyl cellulose; hyperfiltration in charged membranes: prediction of salt rejection from equilbrium measurements; and streaming potential during hyperfiltration. (OSW)
W73-09640

SPRAY FREEZING, DECANTING, AND HYDROLYSIS AS RELATED TO SECONDARY REFRIGERANT FREEZING,
Avco Corp, Wilmington, Mass. Avco Space Systems Div.
Wallace E. Johnson, James H. Fraser, Walter E. Gibson, Anthony P. Modica, and Gershon Grossman.
Available from the National Technical Information Service as PB-215 036, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 786, June 1972. 137 p, 20 tab, 48 fig, 57 ref. 14-30-2770.

Descriptors: *Desalination, *Crystallization, *Freezing, *Ice, Solubility, Hydrolysis.
Identifiers: Secondary refrigerant freezing, Spray freezer, Decanter, Freon 113, Freon 114.

This report describes research performed on a secondary refrigerant desalination process, specifically freezing, decanting and Freon hydrolysis. Research on a spray freezer is reported. High rates of heat-transfer between feed and refrigerant are effected in a finely dispersed well-mixed spray of the two fluids. Reasonable crystal quality is obtained. The performance of a triplet nozzle configuration is studied from the viewpoint of production rate and permeability. Theory is developed to correlate and explain the experimental data. A theoretical model describes decanting of a stationary, initially uniform, mixture of Freon and water in a vertical column. The analysis provides a simple experimental method to determine droplet size distribution in a liquid-liquid dispersion band and measurement of its decanting rate. Mixtures of water and Freon 113 were studied experimentally. Droplet size distribution was defined in terms of three characteristic parameters. The solubility and hydrolysis rate of Freon 114 have been measured over a range of temperatures and pressures. The apparent first order hydrolysis rate constant of Freon 114 is shown to be sufficiently low that hydrolysis losses can be neglected. The rate of hydrolysis in saline water was somewhat accelerated by the presence of aluminum. A general theory was developed to predict the first order rate constant for hydrolysis of Freon refrigerants. (OSW)
W73-09641

3B. Water Yield Improvement

WEATHER MODIFICATION: PRECIPITATION INDUCEMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-220 348, $6.75 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-212, March 1973. 246 p.

Descriptors: *Weather modification, *Bibliographies, *Artificial precipitation, *Cloud seeding, *Precipitation (Atmospheric), Cloud physics, Meteorology, Climatology, Rainfall, Water yield improvement.

This report, containing 169 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). Author and subject indexes are included.
W73-09114

INTERCEPTION LOSS IN LOBLOLLY PINE STANDS OF THE SOUTH CAROLINA PIEDMONT,
Forest Service (USDA), Asheville, N.C. Southeastern Forest Experiment Station.
W. T. Swank, B. G. Norbert, and J. D. Helvey.
Journal of Soil and Water Conservation, Vol 27, p 160-164, July-August 1972. 5 tab, 17 ref.

Descriptors: *Interception, *Streamflow, *Throughfall, *Loblolly pine trees, *Mixed forests, *South Carolina, Water resources, Watershed management, Water yield improvement, Regression analysis.
Identifiers: South Carolina Piedmont.

Annual interception loss was measured in 5-, 10-, 20-, and 30-year-old loblolly pine stands and in a mature hardwood-pine forest in the Piedmont of South Carolina. Interception loss for the loblolly pine stands was estimated to be 14, 22, 18, and 18 percent of annual precipitation (54 inches). Annual interception loss from the hardwood-pine stand was similar to that of the pine stands. However, on the average, the loss of water intercepted annually by loblolly pine appeared to be about 4 inches greater than the loss estimated from a number of hardwood studies. Where extensive conversions of hardwood to loblolly pine occur, significant reductions in the amount of water available for streamflow or groundwater should be expected.
W73-09383

GEOTHERMAL RESOURSE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: DEVELOPMENTAL CONCEPTS.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 03A.
W73-09439

CRITICAL SOIL MOISTURE LEVELS FOR FIELD PLANTING FOURWING SALTBUSH,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02G.
W73-09683

3C. Use of Water of Impaired Quality

USE OF NATURALLY IMPAIRED WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.

Available from the National Technical Information Service as PB-220 350, $6.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-217, May 1973. 364 p.

Descriptors: *Saline water, *Saline soils, *Salinity, *Irrigation water, *Bibliographies, *Impaired water quality, Salt tolerance, Alkaline soils, Arid lands, Crop production, Desalination, Economic evaluations, Drainage, Groundwater, Land reclamation, Leaching, Osmotic pressure, Plant growth, Sodium.

This report, containing 246 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 53,230 abstracts covering SWRA through February 15, 1973 (Volume 6, Number 4). Author and subject indexes are included.
W73-09116

PRODUCTION OF EIGHT CROPPING SYSTEMS ON SALINE AND GLEYSOLIC ALLUVIUM SOIL, THE PAS, MANITOBA,
E. D. Spratt, B. J. Gorby, and W. S. Ferguson.
Can J Soil Sci. Vol 52, No 2, p 187-193. 1972. Illus.
Identifiers: Alfalfa, Brome, *Canada, Clover, *Gleysolic alluvium soils, Grass, Manitoba, Pas, *Saline soil, Wheat, Crop production.

In 1961, 8 crop rotations were established on a recently drained alluvium soil (5 ha in size). Within the rotation strips the average initial electrical conductivity (ECe) of the 0-30-cm depth ranged from 0.3-28.6 mmhos/cm. Three rotations contained only wheat (with various amounts of summer fallow), 3 contained only forage crops (alfalfa or bromegrass or both), and 2 contained both wheat and forage crops (clover or brome-alfalfa). From 1961-1969 the wheat-clover and continuous alfalfa rotations gave the best yields, thus giving the highest net returns in dollars. In 1969, better yields of wheat were obtained after the forage crop rotations than after the grain rotations. Ground water levels and subsurface soil salinity remained relatively constant throughout the study.--Copyright 1973, Biological Abstracts, Inc.
W73-09238

FUNDAMENTAL PRINCIPLES IN THE STUDY OF WATER AND SALT BALANCES OF GROUNDWATER IN IRRIGATED REGIONS (OSNOVNYYE PRINTSIPY IZUCHENIYA VODNO-SOLEVOGO BALANSA GRUNTOVYKH VOD OROSHAYEMYKH TERRITORIY),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 07B.
W73-09464

3D. Conservation in Domestic and Municipal Use

GEOLOGY AND LAND RECLAMATION,
Kent State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 04A.
W73-09533

ENVIRONMENTAL AND ECONOMIC IMPACT OF RAPID GROWTH ON A RURAL AREA: PALM COAST,
Southeastern Environmental Services, Jacksonville, Fla.
For primary bibliographic entry see Field 05G.
W73-09656

SHORTCUT PIPELINE MODIFICATION CONTRA COSTA CANAL UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-09696

3E. Conservation in Industry

THE GEOPHYSICAL DIRECTORY, (TWENTY-EIGHTH EDITION 1973).

Globe Universal Sciences, Inc., Houston, Texas, 1973, 405 p.

Descriptors: *Exploration, Oil industry, *Geophysics, Seismology, Explosives, Drilling, Core drilling, Drilling equipment, Drill holes, Mineral industry, Soil analysis, Gravimetric analysis, Radioactivity, Radioactive well logging, *Logging (Recording).
Identifiers: Consulting services, Contractors.

A listing of all companies and individuals directly connected with, or engaged in, geophysical exploration is presented. Included are listings in the fields of: Aircraft Services, Boats and Marine Equipment, Consultants (Geophysical), Core Drilling, Data Exchange Service, Drilling Bits, Electronic Supplies, Explosives, Geophysical Instrumentation, Logging services, Mining, Non-Dynamite Energy Source Equipment, Oceanographic Instruments, Radioactive Surveying, Seismology, Soil Analysis, and Supplies (Geophysical). Names, addresses, and company affiliations are given (in the case of individuals.) (Campbell-NWWA)
W73-09256

INTERINDUSTRY ECONOMIC MODELS AND REGIONAL WATER RESOURCES ANALYSES,
For primary bibliographic entry see Field 06B.
W73-09409

THE ECONOMICS OF INDUSTRIAL WASTE TREATMENT,
Environmental Control Consultancy Services Ltd., London (England).
For primary bibliographic entry see Field 05D.
W73-09410

THE EFFECT OF MIXING AND GRAVITATIONAL SEGREGATION BETWEEN NATURAL GAS AND INERT CUSHION GAS ON THE RECOVERY OF GAS FROM HORIZONTAL STORAGE AQUIFERS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 04B.
W73-09589

MINERALS AND DEPOSITS ON STATE LANDS--SALE OR LEASE.
For primary bibliographic entry see Field 06E.
W73-09735

3F. Conservation in Agriculture

EVAPOTRANSPIRATION BY SUGAR CANE AS INFLUENCED BY METEOROLOGICAL FACTORS,
Hawaii Univ., Honolulu. Dept of Geography.
For primary bibliographic entry see Field 02D.
W73-09137

POSSIBLE WAYS OF DEVELOPING IRRIGATED AGRICULTURE IN SOVIET CENTRAL ASIA AND THE FUTURE OF THE ARAL SEA (VOZMOZHNYYE PUTI RAZVITIYA OROSHAYEMOGO ZEMLEDELIYA SREDNEY AZII I BUDUSHCHEYE ARAL'SKOGO MORYA),
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
F. Ya. Ukrainskiy.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 1, p 60-70, January-February 1972. 3 tab, 10 ref.

Descriptors: *Economics, *Agriculture, *Irrigation programs, *Lake fisheries, *Water utilization, Consumptive use, Diversion, Withdrawal, Crop production, Cotton, Fibers (Plant), Textiles, Rice, Water levels, Salinity.
Identifiers: *USSR, Soviet Central Asia, *Aral Sea, Kazakhstan.

The future of irrigated agriculture in Soviet Central Asia is discussed in connection with water withdrawals from the Amu-Dar'ya and Syr-Dar'ya Rivers and the feasibility of preserving and developing Aral Sea fisheries. The area of irrigated land in Soviet Central Asia and southwestern Kazakhstan is to be enlarged from 4.3 million hectares in 1970 to 6.21 million hectares by 1985 and to 7.94 million hectares by 2000. Flow losses from irrigation in the Aral Sea basin could increase from 58 cu km in 1970 to 67 cu km and 79 cu km, respectively, by these periods. At the present rate of decline, the level of the Aral Sea will drop from 51.3 meters (1971) to about 49.5 meters in 1985 and to about 46.0 meters in the year 2000. The salinity of the lake could reach 12.5% by 1985 and 15% by 2000, an increase of 1.5% and 4%, respectively, over that at the beginning of 1971. (Josefson-USGS)
W73-09155

THE EFFECT OF SURFACE TREATMENTS ON SOIL WATER STORAGE AND YIELD OF WHEAT,
South Australian Dept. of Agriculture, Adelaide.
J. E. Schultz.
Aust J Exp Agric Anim Husb., Vol 12, No 56, p 299-305, 1972. Illus.
Identifiers: Cultivation, Evaporation, Fallow, Gypsum, Herbicides, Hexadecanol, Soils, Storage, Straw, Surface treatments, *Wheat, Yield, *Soil water storage, *Australia.

Soil water changes under 6 pre-seeding surface treatments and the following wheat crop were recorded at 3- to 4-weekly intervals in 2 consecutive seasons (1966-67 and 1967-68) on a hard setting red-brown earth in South Australia. The treatments were 'fallow' (initial cultivation in spring, 9 months before sowing), 'grassland' (initial cultivation in autumn, 2 months before sowing), 'chemical fallow' (sprayed with herbicides in spring), and 3 fallows separately modified with gypsum, straw and hexadecanol. Grassland lost water rapidly in spring and this lowerwater content was never completely restored. The fallow plus straw gave the biggest recharge of soil water following rain and the highest water storage efficiency during the fallow period. In 1966-67, recharge of soil water followed rain in summer at a time of high evaporation rates. The effectiveness of the treatments in increasing soil water storage was related to their ability to reduce evaporation. In

1967-68, soil water recharge occurred in autumn when evaporation rates were low. The effectiveness of the treatments was then related to their ability to curb surface sealing by raindrop impact. Nitrate-N contents in the top 60 cm of soil at seeding were higher in 1967 than 1968, probably due to efficient mineralization in 1967 after summer rain, and leaching by heavy rain and denitrification before seeding in 1968. Crops on the fallow plus straw treatment used most water and produced the highest wheat yields with the highest water-use efficiency in both years.--Copyright 1973, Biological Abstracts, Inc.
W73-09241

USE OF WASTES FOR IRRIGATION IN THE DONBAS, (OROSHEVIYE STOCHNYMI VODAMI V DONBASSE),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
For primary bibliographic entry see Field 05D.
W73-09258

IRRIGATION BY SEWAGE, (OROSHENIYE STOCHNYMI VODAMI),
For primary bibliographic entry see Field 05D.
W73-09259

USE OF SEWAGE FOR IRRIGATION, (ISPOLZOVAIYE STOCHNYKH VOD DLYA OROSHENIA),
For primary bibliographic entry see Field 05D.
W73-09260

RURAL WATER SYSTEMS PLANNING AND ENGINEERING GUIDE,
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 04B.
W73-09265

EFFECTS OF NITROGEN, TEMPERATURE, AND MOISTURE REGIME ON THE YIELD AND PROTEIN CONTENT OF NEEPAWA WHEAT,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
J. R. D. Partridge, and C. F. Shaykewich.
Can J Soil Sci. Vol 52, No 2, p 179-185. 1972. Illus.
Identifiers: *Moisture regime, Neepawa, *Nitrogen, Protein, Temperature, *Wheat (Neepawa), Yield.

Experiments were conducted in growth chambers growing wheat on a soil initially low in NO3-N. At rates up to 100 ppm N, grain yield increased with succeeding increments of fertilizer-N. Increased temperatures (15, 21, and 25 degrees C) significantly decreased grain yield in most instances. Low to moderate stress soil moisture regimes (0.3-0.5 and 0.3-2.8 bars) had no significant influence on grain yield. A line was plotted for percent protein vs. added fertilizer-N resulting in a concave protein curve, with an initial decrease in protein to 50 ppm N and a subsequent rise with 100 and 200 ppm N. At each level of N, a close negative correlation was shown between percent protein and grain yield. The effect of increased temperture in increasing percent protein was found to be mostly an indirect effect through the influence of temperature on grain yield. Moisture regime was found to have no significant direct effect on percent protein.--Copyright 1973, Biological Abstracts, Inc.
W73-09281

YIELD OF SOYBEANS AND OIL QUALITY IN RELATION TO SOIL TEMPERATURE AND MOISTURE IN A FIELD ENVIRONMENT,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
A. R. Mack, and K. C. Ivarson.
Can J Soil Sci. Vol 52, No 2, p 225-235. 1972. Illus.
Identifiers: Copper, Environment, Manganese, Moisture, Oil, Phosphorus, Potassium, Soils, *Soybeans, Yield, *Soil temperature.

Under comparable field conditions of air temperature and solar radiation, yield of soybeans increased 43.4% when the day-degrees units of the soil were raised from a seasonal value of 859 to 1822 (>5 degree C) and yield decreased 82.4% when the day-degrees for the same period were lowered to 408 for the 20-cm depth. These heat values from July 10 to September 21 correspond to mean daily soil temperatures of 11.2, 17.7, and 31.2 degrees C. The change in yield represents a reduction on the cold soils of 208 kg/ha (3.1 bu/acre)/1 degree C below the seasonal temperature, and an increase on the warm plots of 54 kg/ha/1 degree C (unfertilized) above the seasonal temperature. In general, yield was related linearly to the reciprocal of the temperature and of the day-degrees. Oil concentration varied little among the 3 soil tempertures, although the I number decreased and the percentage protein increased with higher soil temperature. Coinciding with the high yields on the warm soils was a high concentration of P in the foliage, e.g., 0.15% P at 11.2 degrees C and 0.42% at 31.9 degrees C. During early growth, concentration of K in the plant material increased and that of Mn and Cu was reduced with high soil temperature. This resulted in a greater removal of P and K from the warm soil than from the cool soil, and little difference in removal of Mn and Cu between the low and high temperatures.--Copyright 1973, Biological Abstracts, Inc.
W73-09307

THE CLIMATE OF AN ORANGE ORCHARD: PHYSICAL CHARACTERISTICS AND MICROCLIMATE RELATIONSHIPS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
J. D. Kalma, and G. Stanhill.
Agric Meteorol. Vol 10, No 3 p 185-201p. 1972. Illus.
Identifiers: Canopy, *Climate, Crop. Humidity, Models, *Orange orchard, Physical properties, Pressure, Radiation, Rainfall, Temperature, Vapor, Wind, *Israel.

Measurements are given of radiative and aerodynamic characteristics of a typical mature orange orchard in Israel's coastal plain. Net radiation to the canopy can be calculated adequately for weekly periods and longer from global radiation and 3 radiative crop characteristics. The role of aerodynamic crop characteristics, e.g., in crop water use studies, is discussed. Rainfall, wind run, air temperature and humidity of the air were measured at equivalent heights both in a climate station outside the orchard and above the tree canopy at the experimental orchard site, and the microclimatic modifications associated with the above characteristics are discussed. Rainfall differences were negligible, whereas wind run at the climate station is shown to be significantly under estimated. Absolute differences in temperature never exceeded 2 degrees C, while relative humidity of the air above the canopy was almost constantly 8% higher. Relationships are given for calculating the relevant crop and climate parameters from standard climatic data. The distribution of net radiation, wind flow, air temperature and vapor pressure throughout the day is illustrated. The canopy structure of the orchard is not homogeneous horizontally. The horizontal variations especially affect the transfer of mass, energy and momentum within the canopy. Attempts to simulate these processes within the stand are mostly based on 1-dimensional models, assuming horizontal homogeneity. One-dimensional models of Cowan (1968) for the absorption of net radiation and the alternation of windflow within the canopy were tested. Reasons are given for model breakdown and the need for general 3-dimensional models is stressed.--Copyright 1973, Biological Abstracts, Inc.
W73-09320

A PREDICTION TECHNIQUE FOR SNAP BEAN MATURITY INCORPORATING SOIL MOISTURE WITH THE HEAT UNIT SYSTEM,
National Weather Service, Clemson, S.C.
A. J. Kish, W. L. Ogle, and C. B. Loadholt.
Agric Meteorol. Vol 10 No 3, p 203-209. 1972. Illus.
Identifiers: *Beans (Snap), *Maturity, Prediction, Soils, Technique, *Soil moisture.

The growing-degree hour method was found to be unreliable in predicting the maturity for 3 plantings of 'Harvester' and 'Tendercrop' snap beans. Other environmental factors, in addition to temperature, affected maturity. The available soil moisture for each of the 3 plantings varied greatly. Because of the unreliability of the heat unit method, the available soil moisture parameter was integrated into the degree hour method. The formula that gave the smallest coefficient of variation was one using the daily heat unit multiplied by ratio of the daily available soil moisture to a constant soil moisture. Optimum available soil moisture level to be used as the constant soil moisture value in the formula was in the 57-59% range. Predicting the maturity of snap beans was improved by integrating available soil moisture into the heat unit system.--Copyright 1973, Biological Abstracts, Inc.
W73-09336

THE GROWTH AND PERFORMANCE OF RAIN-GROWN COTTON IN A TROPICAL UPLAND ENVIRONMENT: I. YIELDS, WATER RELATIONS AND CROP GROWTH,
Commonwealth Scientific and Industrial Research Organization, Kununurra (Australia). Div. of Land Research.
A. B. Hearn.
J Agric Sci, Vol 79, No 1, p 121-135, 1972, Illus.
Identifiers: *Cotton, *Crop production, Density, Environment, Genotype, Growth, Irrigation, Leaf, Light, Matter, Rain, Tropical, Upland, Yields.

The effects of environment and genotype on growth and yield of cotton were studied in 3 experiments from 1966-1969. Treatments were date of sowing, variety, fertilizer, plant population and water. Variety BPA66 sown in June at 4-10 plants m-2 out-yielded other varieties, sowing dates and population densities. Compound fertilizer at 1.25 t ha-1 increased yield by 15% and irrigation increased yield by 38%. The soil water deficit (CSWD) was calculated from meteorological data, and the relative water content (RWC) of the plants was measured. CSWD did not affect growth until a critical value (CD) was reached, which increased from 20 to 50 mm as the crop aged. When CD was reached RWC was 0.94 at dawn and 0.83 at 1400 hr. Growth stopped when CSWD > or equal to CD, except while any rain, insufficient to make CSWD < CD, was being consumed. Days while such rain was being consumed and days when CSWD < CD were added to give the effective numbers of growing days which accounted for differences in numbers of mainstem nodes caused by sowing date and spacing, and for differences in plant dry weight and leaf area caused by sowing date. Variation in light transmitted by the crop canopy depended on leaf area index (L) alone; spacing, fertilizer and CSWD had no independent effects. The measured extinction coefficient was 1.1 compared with 0.9 predicted by de Wit's (1965) model. Measured value of crop growth rate (C) agreed with values predicted by the de Wit model for the vegetative phase. Spacing and fertilizer only affected C through L. During the reproductive phase C became much less dependent on L, and the form of the relationship changed. Some varieties including BPA66 had a greater net assimilation rate. Maximum C was expected when L is equivalent or equal to 3, but L was seldom >2. Crops sown at current and previously recommended spacing had sparse canopies and did not fully use light available for dry matter production.--Copyright 1973, Biological Abstracts, Inc.
W73-09379

EFFECT OF TIMING OF IRRIGATION ON TOTAL NONSTRUCTURAL CARBOHYDRATE LEVEL IN ROOTS AND ON SEED YIELD OF ALFALFA (MEDICAGO SATIVA L.),
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil and Water.
Y. Cohen, H. Bielorai, and A. Dovrat.
Crop Sci. Vol 12, No 5, p 634-636. 1972.
Identifiers: *Irrigation efficiency, *Crop production, Alfalfa, Carbohydrate, Irrigation, Medicago sativa, Roots, Seeds, Timing.

The effect of certain soil moisture regimes, manipulated by timing of irrigation, on the seed yield of alfalfa was assessed. Sprinkler-irrigated alfalfa (cv 'Hairy Peruvian') was cut once and the regrowth was left for seed production or cut periodically for forage during the spring to mid-summer period. Seed plots were irrigated either at day 10 or 23, or both (following cutting) to 180-cm soil depth. Forage plots were irrigated once immediately after each cutting. Irrigation at day 23 resulted in a considerably lower rate of foliar regrowth during the first 3 wk following cutting than when irrigation was applied at day 10. Slow regrowth was conducive to greater accumulation of total nonstructural carbohydrate (TNC) in roots than quick regrowth. High TNC level in the roots was associated with high percentage of pods set and with high seed yield. Irrigation both at day 10 and also at day 23 increased the flowering intensity that was associated with a lower percentage of pods set than the other treatments. The seasonal decline of TNC in the roots of plants harvested for seed was smaller than that in the roots of plants cut for forage. It was concluded that timing of irrigation that leads to an increase in the root reserves during the period of initial regrowth is likely to increase the seed yield potential of alfalfa.--Copyright 1973, Biological Abstracts, Inc.
W73-09418

FLOW-METER FOR UNDERGROUND IRRIGATION PIPELINES,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Engineering.
For primary bibliographic entry see Field 07B.
W73-09423

FACTORS RELATED TO THE IRRIGATION OF MARYLAND TOBACCO: I. AGRONOMIC EFFECTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Agriculture.
G. W. Brown, and O. E. Street.
Tob Sci. 16, p 55-60. 1972. Illus.
Identifiers: Agronomic effects, Fertilization, Irrigation, *Maryland, Nitrogen, Plant population, *Tobacca, Yield.

The effect of irrigation, N level, plant population, and 2 varieties on the yield and value of Maryland tobacco was studied. Irrigation increased the yield in 2 of 4 yr tested. The value/acre was increased only in 1966, a very dry year. Increasing the N rate from 90-120 lb/acre significantly increased the yield. The plant populations evaluated resulted in no significant alterations of yield or value. The 'Wilson' cultivar outyielded 'Catterton.' Yield increased as N rate increased for irrigated and non-irrigated tobacco. Value/acre was highest at the 120 lb N rate on irrigated plots. On non-irrigated plots, tobacco which received the 150 lb N rate had a higher value/acre than that from the 90 lb N rate but was the same as for tobacco fertilizer with 120 lb of N. When irrigation was applied, 'Wilson' produced the greater yield. When no irrigation was applied, no difference in yield and value occurred between the 2 cultivars suggesting that this result was a function of the water alone. Reduced growth because of water caused reduced yields with each of the 3 N rates.--Copyright 1973, Biological Abstracts, Inc.
W73-09427

OSCILLATIONS IN STOMATAL CONDUCTANCE AND PLANT FUNCTIONING ASSOCIATED WITH STOMATAL CONDUCTANCE: OBSERVATIONS AND A MODEL,
Australian National Univ., Canberra. Dept. of Environmental Biology.
For primary bibliographic entry see Field 02I.
W73-09429

EFFECTS OF SOIL AND MANAGEMENT FACTORS ON FERTILIZER RESPONSES AND YIELD OF IRRIGATED WHEAT IN IRAN,
T. P. Abraham, and A. Hoobakht.
Exp Agric. Vol 8, No 3, p 195-202. 1972.
Identifiers: Fertilizers, *Iran, Irrigation, Management, Soils, *Wheat, Yield.

The yield data obtained from fertilizer experiments conducted at 195 locations for 3 yr were examined to study the relations between yield, response to N and P,soil test values, and number of irrigations, using multiple regression technique. Irrigation accounted for 20-36% of the yield variation, whereas soil factors did not show appreciable effects. N response was influenced by irrigation, while some soil factors affected response to P.--Copyright 1973, Biological Abstracts, Inc.
W73-09436

INFLUENCE OF THE MID-SUMMER DRAINAGE ON THE ACTIVITY OF ROOTS OF PADDY RICE (IN JAPANESE),
Tokyo Univ. of Agriculture and Technology (Japan). Faculty of Agriculture.
T. Tanabe.
J Agric Sci Tokyo Nogyo Daigaku, Vol 16, No 1, p 35-43, 1971, Illus, English summary.
Identifiers: *Drainage (Paddy rice), Guttation, Naphthylamine, Oxidation, *Rice, *Roots (Rice), Seasonal.

Experimental plots were drained at 55-45 days, at 45-35 days and at 35-25 days before heading time. In addition to its influence on root activity, the amount of alpha-naphthylamine oxidation by roots, amount of guttation from the leaf and the number of water drops/number of green leaves were measured. By mid-summer drainage, the root activity was vigorous and remained so until the later part of growth. The measurement of guttation and of the number of water drops/number of green leaves were correlated with alpha-naphthylamine oxidation, and root activity could be assessed from the shoot growth conditions. The most effective time of the mid-summer drainage was 45-35 days before heading.--Copyright 1973, Biological Abstracts, Inc.
W73-09472

WATER USE BY IRRIGATED COTTON IN SUDAN: III. BOWEN RATIOS AND ADVECTIVE ENERGY,
Projet Rech. Agron, Bassin Fleuve Senegal, Dakar.
D. A. Rijks.
J Appl Ecol, Vol 8, No 3, p 643-663, 1971, Illus.
Identifiers: *Advective energy, *Cotton, Energy, Humidity, Irrigation, *Sudan, Temperature, Wind, *Bowen ratios.

Wet-and dry-bulb temperatures and wind speed were measured over irrigated cotton at various heights and distances from the leading edge of a field lying downwind from a bare, fallow area. Together with radiation balance data, they were used to estimate vertical (Ev) and horizontal (delta E sub h) fluxes of water vapor during day and night. Vertical fluxes were estimated both by the Bowen ratio method and from the Thornthwaite-Holzman formula. Under near-neutral conditions the 2 estimates did not agree well. On theoretical grounds the Bowen ratio estimate was preferred. Horizontal fluxes below the effective level of measurement of Ev were obtained from wind speed and the humidity gradient in the x-direction at various heights. Cross-wind variation in profiles of temperature and humidity was small at heights greater than 40 cm above the crop. In a check on the estimated income and expenditure of energy over a complete irrigation cycle, a discrepancy from 5 to 15% (depending on fetch and crop development) was found. Mean Bowen ratios were calculated to illustrate the variation in temperature and humidity above the crop with fetch, stage in irrigation cycle and crop development. The estimates of total evaporation suggested that irrigation water was unevenly distributed over the field; that evaporation rates early in an irrigation cycle were smaller than in the middle of a cycle, perhaps because the roots were less active, an effect more apparent early in the season than late; that evaporation was less than the potential rate towards the end of the irrigation cycles in the first 1/2 of the season, probably because soil water was limiting; that the rate of evaporation from an actively growing crop, not short of water, was often as much as 1.8 times as large as the rate at which net radiant energy became available to the crop, if both local and general advection were important, and as much as 1.5 times the rate of net radiant energy supply if general advection alone was important; that local advection was not very noticeable beyond about 200 m from the leading edge, but that general advection was noticeable over the whole field. (See also W69-06756)--Copyright 1973, Biological Abstracts, Inc.
W73-09473

THE STUDY ON SOME METEOROLOGICAL CONDITIONS AND PRODUCTIVITY OF RICE IN KOREA (IN KOREAN),
Seoul National Univ., Suwon (Republic of Korea). Coll. of Agriculture.
E. W. Lee.
Res Rep Off Rural Dev (Crop) (Suwon). 14, p 7-31, 1971, English summary.
Identifiers: *Korea, *Meteorological conditions, *Rice, Crop production.

The highest rice yield and ripening ratio were obtained when the rice cultivars headed about Aug. 15 at Suwon, about Aug. 20 at Milyang and about Aug. 25 at Iri, respectively. Highly significant correlations between the climatic conditions during the period of 20 days before and after heading and rice yield or its components, were noted.--Copyright 1973, Biological Abstracts, Inc.
W73-09475

RECOVERY PROCESSES AFTER LEAF CUTTING IN CEREALS AND FORAGE GRASSES: IV. SOME PHYSIOLOGICAL CHANGES IN RICE PLANTS FOLLOWING DEFOLIATION, (IN JAPANESE),
Tohoku Univ., Sendai (Japan). Faculty of Agriculture.
K. Sato.
Proc Crop Sci Soc Jap. Vol 39, No 1, p 15-20. 1970. Illus. English summary.
Identifiers: Carbohydrates, *Cereals, Chlorophyll, Defoliation, *Forage grasses, Grasses-M, *Leaf cutting, Nitrogen, Physiological changes, *Rice-M, Roots, Transpiration.

In defoliated plants, water and N content increased with a concomitant increase in transpiration per unit weight of shoot. Recovery was most rapid in leaf formation and N absorption with the reduction of carbohydrate content in the stem and leaf-sheath. Chlorophyll content was higher in the treated plant with a higher photosynthesis. During the 10 days following defoliation, root activity was lower due to the cessation of new root formation. After that as the new roots emerged and elongated, the activity of the treated plants surpassed that of the control. The higher growth rate in the later half of the life of the defoliated plant was considered to be caused by the physiological juvenilization induced from the later formation of

new roots and their persistence.--Copyright 1972, Biological Abstracts, Inc.
W73-09483

CHANGES IN CYTOKININ ACTIVITY ASSOCIATED WITH THE DEVELOPMENT OF VERTICILLIUM WILT AND WATER STRESS IN COTTON PLANTS,
California Univ., Davis. Dept. of Plant Pathology.
I. Misaghi, J. E. Devay, and T. Kosuge.
Physiol Plant Pathol. Vol 2, No 3, p 187-196. 1972. Illus.
Identifiers: Chromatography, *Cotton-D, Gossypium-hirsutum-D, Tracheal, *Verticillium wilt, Water stress, *Cytokinin activity.

Tracheal fluid and extract from leaves and stems of both healthy and Verticillium-infected cotton plants (Gossypium hirsutum L. cv. 'Acala SJ-1') contain 3 cytokinin-active substances which can be separated from each other by thin-layer chromatography. There are significant reductions in the levels of cytokinins in tracheal fluid and extract from leaves and stems of Verticillium-infected cotton plants compared to that of healthy plants. A time course study showed that the changes in cytokinin activity in Verticillium-infected cotton occurred after development of leaf symptoms. The leaves and stems of cotton plants exposed to water stress contained less cytokinins than those from normal plants. However, there was a greater loss of cytokinin activity in extract from leaves and stems in Verticillium-infected plants than in plants subjected to water stress. The TLC Rf values of 2 of the factors from cotton were similar to those of zeatin mononucleotide and zeatin; however, their structural relatedness to zeatin or zeatin mononucleotide is unknown. The chromatographic behavior of the third factor from cotton was different from the known cytokinins.--Copyright 1972, Biological Abstracts, Inc.
W73-09532

PATHOGENICITY OF PYRICULARIA AND COCHLIO-BOLUS CONIDIA COMPRESSED BY HYDROSTATIC PRESSURE (EFFECT OF PHYSICAL FACTORS UPON PLANT DISEASES: V.). (IN JAPANESE),
Gifu Univ. (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 02I.
W73-09536

THE INTERNAL WATER STATUS OF THE TEA PLANT (CAMELLIA SINENSIS): SOME RESULTS ILLUSTRATING THE USE OF THE PRESSURE CHAMBER TECHNIQUE,
Tea Research Inst. of East Africa, Kericho (Kenya).
M. K. V. Carr.
Agric Meteorol. Vol 9, No 5, p 447-460, 1972. Illus.
Identifiers: Camellia-Sinensis-D, Depletion, Illustrating, Internal, Moisture, Plant, *Pressure chamber technique, Soils, *Sap tension, Stomata, *Tea-D, Tension, Wind.

There is a diurnal change in the sap tension of shoots taken from both irrigated and unirrigated tea plants. Early in the morning the sap tension is low; it increases until about 10:00 hr and then remains almost constant, decreasing from about 16:00 hr. Stomatal closure appear to limit the increase in sap tension during the middle of the day, even when the tea is growing in wet soil. The stomata of 2 genetically distinct populations of tea differ in their sensitivity to increasing sap tension. Sap tension measurements confirm that sheltered tea can deplete soil water faster than tea more exposed to the wind.--Copyright 1972, Biological Abstracts, Inc.
W73-09541

WINTER AND SUMMER GROWTH OF PASTURE SPECIES IN A HIGH RAINFALL AREA OF SOUTHEASTERN QUEENSLAND,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropical Pastures.
For primary bibliographic entry see Field 04A.
W73-09545

THE RESPONSE OF A PANGOLA GRASS PASTURE NEAR DARWIN TO THE WET SEASON APPLICATION OF NITROGEN,
Northern Territory Administration, Darwin (Australia). Animal Industry Agricultural Branch.
K. Hendy.
Trop Grassl. Vol 6, No 1, p 25-32. 1972. Illus.
Identifiers: *Australia (Darwin), Digitaria-Decumbens-m, *Grass-m, *Nitrogen, *Pangola pasture, Protein, Wet season.

The response of a pangola grass (Digitaria decumbens) pasture to N fertilizer at 0, 100, 200, 400, 600 lb N/acre in split applications during the wet season was measured. There was a response in dry matter production up to the highest N level, but the differences in response occurred mainly during the early showers and not during the monsoonal rains of the wet season. Crude protein content and crude protein production/acre increased and the N recovery decreased with increasing levels of N fertilizer over the whole growing season. The P and K contents of the pasture were low.--Copyright 1972, Biological Abstracts, Inc.
W73-09549

ECOLOGY OF PASTORAL AREAS IN THE ARID ZONE OF RAJASTHAN.
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 04A.
W73-09550

RICE RESPONSE TO ZN IN FLOODED AND NONFLOODED SOIL,
Tennessee Valley Authority, Muscle Shoals, Ala. Soils and Fertilizer Research Branch.
P. M. Giordano, and J. J. Mortvedt.
Agron J. Vol 64, No 4, p 521-524, 1972. Illus.
Identifiers: Cultivars, Fertilization, Flooded soils, Minerals, Nonflooded soils, Nutrients, Oryza-Sativa-M, Phosphorus, *Rice-M, *Soils, *Zinc.

Rice (Oryza sativa L. cv. 'Bluebelle') was grown in greenhouse pots on flooded and moist, limed Crowley oil (pH 7.5). P, as concentrated superphosphate, was applied at rates of 20 and 200 ppm and Zn as ZnSO4, was applied at rates of 1, 4, and 16 ppm. Dry matter production and P uptake of immature plants were doubled and uptake of Zn was up to 5 times as great when the plants were grown on flooded rather than moist soil. The Zn concentration in the tissue decreased at the high P rate on moist but not flooded soil. The percentage recovery of fertilizer Zn by the crop was greater from flooded than moist soil, especially at the high P rate. Mixed and surface applications of Zn were comparable for flooded rice, whereas middepth placement (8 cm below soil surface) was less effective. Both surface and middepth placement were less effective than mixing under nonflooded soil conditions. The mobility of Zn applied as ZnSO4 was comparable in flooded and moist soil. The amount of diethylenetriamine pentaacetate (DTPA)-extractable Zn tended to be higher in moist than in flooded soil. This suggests that DTPA may not provide a reliable measure of Zn availability in flooded soils and that differences in Zn uptake may be related to root distribution or some other physiological or morphological characteristic of rice roots growing in moist or flooded soil.--Copyright 1972, Biological Abstracts,Inc.
W73-09551

THE GROWTH, COMPOSITION AND NUTRIENT UPTAKE OF SPRING WHEAT: EFFECTS OF FERTILIZER-N, IRRIGATION AND CCC ON DRY MATTER AND N, P, K, CA, MG, AND NA,
Rothamsted Experimental Station, Harpenden (England).
J. K. R. Gasser, and M. A. P. Thorburn.
J Agric Sci. Vol 78, No 3, p 393-404, 1972. Illus.
Identifiers: Ammonium, Calcium, Chlorides, *Fertilizers, Growth, *Irrigation, Magnesium, *Nitrogen, Nutrients, Phosphorus, Potassium, Sodium, *Wheat-M, Dry matter.

Kloka spring wheat grown on a sandy-loam soil was given 50, 100, 151 or 201 kg N/ha as fertilizer, was irrigated during drought or not irrigated, and was sprayed with CCC (2-chloroethyltrimethylammonium chloride) or not sprayed. Samples, taken approximately weekly from brairding to heading and less frequently to maturity measured the production of dry matter. The dried samples were analyzed for percentage N, P, K, Ca, Mg and Na and the uptakes of these were calculated to measure the effects of treatments on the composition of the crop and the weights of nutrients it contained. Increasing amounts of fertilizer-N up to 151 kg N/ha increased the maximum weight of straw without irrigation and up to 201 kg N/ha with irrigation; similarly, maximum weights of ears were with 100 kg N/ha without irrigation and 151 kg N/ha with irrigation. The maximum weight of straw was at flowering and of ears at maturity. Irrigation increased yields of straw and ears, more with the 2 larger than with the 2 smaller amounts of fertilizer-N. Spraying with CCC decreased the yield of straw, and did not affect the yield of ears. Increasing amounts of fertilizer-N increased percentage nutrients in the green crop and in the straw, and of N, P and Mg in the ears. Effects of irrigation and spraying with CCC on composition differed between nutrients and between ears and straw, sometimes increasing, sometimes decreasing, and sometimes having no effect, on percentage in dry matter. Increasing fertilizer-N increased the maximum weight of N, K, Ca and Na in the crop. P and Mg increased with up to 151 kg N/ha, but was no more with 201 kg N/ha. Maximum weight of N. P., Mg and Na was found at or near maturity, of K at heading and of Ca at flowering.--Copyright 1972, Biological Abstracts, Inc.
W73-09552

A WATER BALANCE MODEL FOR RAIN--GROWN, LOWLAND RICE IN NORTHERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Darwin (Australia). Coastal Plains Research Station.
A. L. Chapman, and W. R. Kininmonth.
Agric Meteorol. Vol 10, No 1/2, p 65-82, 1972. Illus.
Identifiers: *Australia, *Evapotranspiration, Model studies, Northern, Rain, Rainfall, *Rice-M, Transpiration, Water balance model.

The rice farming system is based on short duration (100 days) photoperiod-insensitive varieties. The seed bed is prepared in the flooded state, and the crop is sown during mid-Jan.-early Feb. when rainfall and tillage criteria are satisfied. The model, based mainly on field measurements of evapotranspiration, was used to estimate the success frequency of rain-grown, lowland rice at Darwin, Koolpinyah and Humpty Doo with 93, 48 and 24 yr of rainfall records, respectively. Daily estimates of soil water storage and depth of ponded water for each wet season, Sept. 1-May 31 were obtained. Rainfall was regarded as adequate providing there were at least 14 days pondage plus or minus 3 in. between Dec 31 and Feb. 18 for wet tillage before sowing, at least 80 days between sowing date and the last date at which ponded water was present on the field, not more than 10 consecutive zero pondage days between 50 and 80 days after sowing, corresponding to the stage of

panicle initiation through flowering. A 23-yr comparison showed that on the average, the water availability was similar at the 3 stations, although differences sometimes occurred within individual seasons. The expectation of crop failure due to inadequate rainfall at Darwin is about 1 ye in 30. In addition there is an expectation of major yield reduction of about 1 yr in !0. The seasons of crop failure and low yield tended to occur in groups after relatively long runs of seasons of adequate rainfall. Designing for a maximum field pondage greater than 10 in. did not reduce the estimated number of crop failures at any station. The results are dicussed in relation to practical farming operations.--Copyright 1972, Biological Abstracts, Inc.
W73-09553

WHEAT RESPONSE TO DIFFERENT SOIL WATER-AERATION CONDITIONS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
M. G. Anaya, and L. H. Stolzy.
Soil Sci Soc Am Proc. Vol 36, No 3, p 485-489, 1972. Illus.
Identifiers: *Aeration, Grain Oxygen, Protein, Soils, Triticum-Aestivum-M, *Wheat-M, *Soil water.

A graphical yield surface was constructed for wheat (Triticum aestivum L.) grown on Yolo silt loam with 13 different soil water-aeration combinations. The experiment was conducted in a growth chamber under controlled environmental conditions. O2 over the soil surface was maintained at different percent O2 concentrations 0.9-21%. Various soil water regimes were obtained by irrigation at different soil suctions 8-99 centibars (cbars). The highest grain yields were obtained in 2 treatments, one of 9.6% O2 watered at a soil suction of 15 cbars, and another treatment of 4.3% watered at cbars. The lowest production was in the treatment of 0.9% O2 watered at 99 cbars, and the difference between the highest and lowest yields was 347%. From the data, the regression equation for grain yield was Y ± 15.94 - 0.1324 X1 + 3.1813 X2 ± 0.1297X22, where Y ± grain yield in g/pot, X1 ± soil suction in cbars, and X2 ± percent O2. The maximum predicted yield calculated from the equation is at a level of 12.0% of O2 irrigated at a soil suction of 8 cbars. However, the maximum production recorded was obtained at 9.6% O2. There was a high correlation coefficient (0.94) between water consumption and grain production. An inverse relationship existed between grain yield and protein content. The highest level of grain protein content (22.6%) was obtained in the lowest producing treatment, while the lowest level of grain protein content (16.5%) occurred in the highest producing treatment. The difference in grain protein content between treatments was 37%.--Copyright 1972, Biological Abstracts, Inc.
W73-09555

METHODS OF PLANTING RICE (ORYZA SATIVA L.) IN PUDDLED SOIL,
Central Rice Research Station, Shoranur (India).
R. R. Nair, G. R. Pillai, P. N. Pisharody, and R. Gopalakrishnan.
Indian J Agric Sci. Vol 41, No 11, p 948-951, 1971.
Identifiers: Oryza-Sativa, Planting, *Rice, Seeds, *Soils puddled, Sprouts, Transplanting.

Transplanting 25-day-old seedlings from wet nursery, raising seedlings according to 'dapog' system and transplanting at the age of 14 days, dibbling sprouted seeds, and broadcasting sprouted seeds on mud and in standing water were compared. Under conditions of adequate water control, dibbling sprouted seeds gave a yield equal to that given by transplanting. These 2 methods were superior to the rest. Dibbling was also the most economical method.--Copyright 1973, Biological Abstracts, Inc.
W73-09559

INFLUENCE OF WATER REGIMES AND STARCH ON THE GROWTH, YIELD AND NUTRIENT ABSORPTION BY RICE (ORYZA SATIVA L.),
Fertilizer Corp. of India, Sindri. Planning and Development Div.
J. D. Naphade, and B. P. Ghildyal.
Indian J Agric Sci. Vol 41, No 11, p 963-966. 1971.
Identifiers: Absorption, Growth, Nutrients, Oryza-sativa, *Rice, Roots, *Starch, Toxic substances, *Water regime, Yield.

In lateritic sandy clay-loam soil, plant growth and yield were significantly higher under shallow flooding than at a soil-moisture tension of 60 cm and deep flooding, possibly due to higher root proliferation and greater uptake of N, P and Fe, and a lower uptake of Mn. Starch application to the soil increased the absorption of N, P, Fe and Mn in the plant because of highly reducing conditions and their consequent increased in the soil. Starch had an adverse effect on the growth and yield of rice; this was probably due to intense reducing conditions and the formation of toxic substances in the soil.--Copyright 1973, Biological Abstracts, Inc.
W73-09562

WATER REQUIREMENTS OF DWARF WHEAT (TRITICUM AESTIVUM L.) UNDER WEST BENGAL CONDITIONS,
Jute Agricultural Research Inst., Barrackpore (India).
S. R. Gupta, and K. S. Dargan.
Indian J Agric Sci. Vol 41, No 11, p 958-962. 1971.
Identifiers: Climate, *India (Bengal), Irrigation, Triticum-aestivum, *Water requirements, *Wheat (Dwarf).

The optimum water requirement was 382.04 mm in 1967-68 and 221.70 mm in 1968-69. The optimum regime to schedule irrigation was 50% of the available moisture; but it decreased to 10% of available moisture when the climate was wet and cool, as in 1968-69. 'PV 18' gave 1.68 q/ha more yield (mean for 2 yr) than 'Sonora 64'. The application of 80 and 120 kg N over 40 kg N/ha, 3/4 at sowing and 1/4 at first irrigation, increased the grain yield by 28.1 and 51.2% in 1967-68 and 27.8 and 45.7% in 1968-69, the mean increase being 27.9 and 48.2% respectively. The peak period of the rate of water-use occurred at the earing and grain-filling stages.--Copyright 1973, Biological Abstracts, Inc.
W73-09563

EFFECTS OF MOISTURE REGIMES AND NITROGEN LEVELS ON GROWTH AND YIELD OF DWARF WHEAT VARIETIES,
Rockefeller Foundation, New Delhi (India).
N. P. Singh, and N. G. Dastane.
Indian J Agric Sci. Vol 41, No 11, p 952-958. 1971.
Identifiers: Growth, Moisture, *Nitrogen, Triticum-aestivum, *Wheat (Dwarf), Yield, Cultivars, Fertilization.

Three dwarf wheat (Triticum aestivum L.) cultivars were studied for their response to 3 moisture regimes and 3 N levels. 'Kalyan Sona' gave the maximum yield (49.9 q/ha), followed by 'Safed Lerma' (45.9 q/ha) and 'Sonalika' (42.5 q/ha) when sown on equal-grain-weight basis. 'Sonalika' had the boldest grain and the yield was best on per-plant basis. Irrigation at 0.25 atm tension measured at a depth of 22 cm was the optimum. Use of water was the lowest at 0.75 atm tension. N at 150 kg/ha produced the highest yield in the first yr when the initial N status of the soil was 0.038%. In the second year, no differential response was noted when the initial N content of the soil was 0.065%. For economic utilization of fertilizer resources, therefore, N application should be commensurate with initial N status of the soil.--Copyright 1973, Biological Abstracts, Inc.
W73-09566

RICE RESEARCH IN FIJI, 1960-1970: III. WEED CONTROL,
Department of Agriculture, Suva (Fiji). Research Div.
N. P. Patel.
Fiji Agric J. Vol 34, No 1, p 27-34. 1972.
Identifiers: Dicots, *Fiji, Grass, *Herbicides, Phenoxy, Propanil, *Rice, *Weed control, Grasses.

In 1967-1971 herbicides were evaluated for use in short-stature, close-spaced dryland rice. Propanil applied post emergence at 3 lb active ingredient/acre (3.4 kg/ha), when weeds are at the 2-3 leaf stage and growing actively, gave good control of grasses and common dicots. Trials in 1969 and 1970 showed that phenoxy herbicides can be safely used to control broad-leafed weeds at a later stage. In transplanted wetland rice, grass weeds are no problem and other weeds generally are not serious, particularly under controlled irrigation (as opposed to rain-fed) conditions. Phenoxy herbicides applied 3-4 wk planting give adequate control. With direct seeding (broadcasting) on to puddled surface, followed by flooding, grass weeds are a serious problem. Propanil is useful but does not give complete control.--Copyright 1973, Biological Abstracts, Inc.
W73-09569

EFFECT OF AERIAL ENVIRONMENT AND SOIL WATER POTENTIAL ON THE TRANSPIRATION AND ENERGY STATUS OF WATER IN WHEAT PLANTS,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
S. J. Yang, and E. DeJong.
Agron J. Vol 64, No 5, p 574-578, 1972. Illus.
Identifiers: Aerial environment, Capillary conductivity, *Energy status, Evaporation, Humidity, Soils, Temperature, Texture, *Transpiration, Triticum-aestivum, *Wheat, Wilting, *Soil-water potential.

Thatcher wheat (Triticum aestivum L.) was grown under 4 combinations of air temperature and relative humidity in a loam and a clay soil. The relationship between transpiration rate and soil water potential depended on evaporative demand and soil texture. The decline in the transpiration rate from its maximum commenced at higher soil water potentials under conditions of higher evaporative demand and was more gradual on the clay than on the loam soil, presumably due to the higher capillary conductivity of the former. Permanent wilting occurred at soil water potentials of -20 to -25 bars on the loam soil and at -45 to -50 bars on the clay soil. At these potentials the capillary conductivities of both soils were about equal. Resistance to water flow in the plant decreased with increased temperature, while changes in relative humidity had no consistent effect. The total resistance to water movement in the plant and the soil increased with decreasing soil water potential and decreasing air temperature. The relationship between leaf water potential and relative water content was affected by aerial environment and soil texture.--Copyright 1973, Biological Abstracts, Inc.
W73-09570

INFLUENCE OF WINDBREAKS ON LEAF WATER STATUS IN SPRING WHEAT,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
A. B. Frank, and W. O. Willis.
Crop Sci. Vol 12, No 5, p 668-672. 1972.
Identifiers: *Leaf water status, Shelterbelts, Stomatal diffusion, Triticum-aestivum, *Wheat, Wind, *Windbreaks, Water potential.

Spring wheat (Triticum aestivum L.) was grown for 2 years with 3 shelter conditions: (a) exposed, (b) surrounded by a slat barrier, and (c) adjacent to tree shelterbelts. Leaf water potential, stomatal diffusion resistance, and meteorological factors were monitored on selected days. The shelterbelt

and slat-barrier plots received 28 and 69% as much wind as the exposed plot, respectively. Air temperature was slightly higher in the sheltered plots. Vapor pressure deficits were similar for all 3 conditions. Generally, leaf water potentials were associated with those plots receiving less total wind movement. Stomatal diffusion resistance was less and at a lower leaf water potential for exposed compared to sheltered plants. The data indicate that water relations of wheat plants are more favorable for plant growth and yield when grown with shelter compared to exposed conditions.--Copyright 1973, Biological Abstracts, Inc.
W73-09571

MATHEMATICAL DESCRIPTION OF THE INFLUENCE OF TEMPERATURE AND SEED QUALITY ON IMBIBITION BY SEEDS OF CORN (ZEA MAYS L.),
Western Australia Univ., Nedlands. Dept. of Agronomy.
W. M. Blacklow.
Crop Sci. Vol 12, No 5, p 643-646. 1972.
Identifiers: *Corn seeds, Germination, *Imbibition, Mathematical equations, Permeability, Seeds, *Temperature, Zea-mays.

Imbibition by seeds of corn was described by the equation W ± f (t) -- (alpha Wo')/exp (kt) where W is the water content of the seed on a dry weight basis, f (t) ± alpha + bt and is the asymptote of the exponential curve where alpha is the asymptote at time t ± O and b the slope, and Wo' is an adjusted initial water content. The rate constant k was shown to be related to the permeability of the seed to water, alpha to the initial water capacity of the seed, and b to the rate of change in the water capacity of the seed during imbibition which was related to elongation of the radicle and shoot. The initial water content, Wo, was linearly related to the relative humidity of the atmosphere in which the seed had equilibrated. The parameters k, b, and alpha were not significantly affected when Wo varied from 2.0 to 13.9%. Both k and b increased exponentially with temperature with a Q (10) of 2.37 and 1.85 respectively, over the range 12 to 31C and 12 to 32.5, respectively; there was a sharp departure from the exponential relationship outside these ranges of temperature. The energy of activations of the exponential and linear phases of imbibition were 15.3 and 9.1 kcal/mole, respectively. The parameter alpha varied less dramatically with temperature and was fitted by a 4th order polynomial in temperature with a minimum at 26C. The parameters of the imbibition curve also were a function of age and variety of the seed. A survey of the literature showed that the equation for imbibition could be used to describe imbibition of a wide range of seeds. The equation will be used in a mathematical model to predict germination and emergence of corn in a changing environment.--Copyright 1973, Biological Abstracts, Inc.
W73-09572

INFLUENCE OF TEMPERATURE ON GERMINATION AND ELONGATION OF THE RADICLE AND SHOOT OF CORN (ZEA MAYS L.),
Western Australia Univ., Nedlands. Dept. of Agronomy.
W. M. Blacklow.
Crop Sci. Vol 12, No 5, p 647-650. 1972.
Identifiers: *Corn, *Germination, Mathematical models, Planting, Radicle, Shoots, *Temperature, Zea-mays.

Radicle and shoot elongation of seedlings of corn (Zea mays L. cv 'UH108') grown in wet, freely drained vermiculite were approximated by linear functions of time. The rates of elongation were greatest at about 30C and effectively ceased at 9 and 40C. The time for initiation of a radicle and a shoot decreased to a minimum at 30C with the radicle preceding the shoot. The water content of the seeds at initiation of the radicle were 57% at 30C and increased at less favorable temperature to as much as 75% at 12C. Shoot initiation occurred at 7 to 10% higher water content than radicle initiation. The rate of radicle elongation was independent of the shoot but removal of the radicle reduced shoot growth by 15% at 20C. The apical meristem of an emerged seedling at 20C remained below the soil surface and was a function of the depth of planting. The equations derived for the processes and events have been incorporated into a mathematical model to predict germination and emergence of corn.--Copyright 1973, Biological Abstracts, Inc.
W73-09573

AERIAL THERMAL SCANNER TO DETERMINE TEMPERATURES OF SOILS AND OF CROP CANOPIES DIFFERING IN WATER STRESS,
Florida Univ., Gainesville. Dept. of Climatology.
For primary bibliographic entry see Field 07B.
W73-09575

EFFECTS OF NORTH-AND SOUTH-FACING SLOPES ON YIELD OF KENTUCKY BLUEGRASS (POA PARTENSIS L.) WITH VARIABLE RATE AND TIME OF NITROGEN APPLICATION,
Agricultural Research Service, Morgantown, W. Va. Soil and Water Conservation Research Div.
O. L. Bennet, E. L. Mathias, and P. R. Henderlong.
Agron J. Vol 64, No 5, p 630-635, 1972.
Identifiers: *Kentucky bluegrass, *Nitrogen, Nutrition, Poa-pratensis, Radiation, *Slopes, Temperature, Yield.

Kentucky bluegrass was treated with 0, 112, 224, 448, and 672 kg/ha rates of N applied singly and in split applications. Slopes were approximately 35%. Soil on both slopes was Gilpin silt loam. The rate of growth, total yield, seasonal distribution of yield, and N recovery in plants were influenced greatly by slope orientation. Production on the north-facing slope was more than twice that on the south-facing slope. Splitting the N applications tended to produce a higher yield and more uniform seasonal distribution. A combination of high soil temperatures and low soil moisture levels appeared to limit growth on the south-facing slope. Maximum soil temperature 2.5 cm (1 in.) below the soil surface on the north-facing slopes were 8-10C less than on the south-facing slope. Yield differences due to slope orientation completely overshadowed any yield responses from specific fertility treatments.--Copyright 1973, Biological Abstracts, Inc.
W73-09576

GROWTH ANALYSIS OF TWO SAINFOIN (ONOBRYCHIS VICIAEFOLIA SCOP.) GROWTH TYPES,
Agricultural Research Service, Bozeman, Mont. Plant Science Research Div.
C. S. Cooper.
Agron J. Vol 64, No 5, p 611-613, 1972.
Identifiers: Assimilation, *Growth, Irrigation, Leaf, Moisture, Onobrychis-viciaefolia, Radiation, *Sainfoin, Soil types, Yields.

Growth of 'Remont,' a '2-cut' type cultivar, and 'Eski,' a '1-cut' type cultivar was quantitatively analyzed in relation to adaptation to dryland or to areas with limited irrigation water. Yields of 'Remont' were significantly higher than those of 'Eski' when sampled on May 12, but because of a greater relative growth rate (RGR, g/g/wk), 'Eski' surpassed 'Remont' in yield when sampled on June 21. The greater RGR of Eski was associated with a significantly greater leaf area ratio (LAR, dm sq/g). The LAR of both species decreased with advancing maturity as a result of increasing stem-leaf ratio. Net assimilation rate (g/dm sq/wk) of these 2 cultivars was not significantly different. Crop growth rate (CGR, g/m sq/da) increased as the season advanced and appeared to be greatest for 'Eski.' Both species produced the majority of their leaves early with maximum leaf area index occurring on or before June 8. Specific leaf weight (cm sq/g) of cultivars was similar at the first 3 sampling dates, but was significantly greater for 'Remont' at the last sampling date. A late-maturing '1-cut' type sainfoin would most efficiently utilize soil moisture and incident radiation in areas where soil moisture is limiting after July 1.--Copyright 1973, Biological Abstracts, Inc.
W73-09577

EFFECT OF WET GROWING SEASONS ON HERBAGE GROWTH ON SOILS WITH IMPEDED DRAINAGE,
Foras Taluntais, Ballinamore (Ireland). Soil Physics Field Station.
J. MulQueen.
Ir J Agric Res. Vol 11, No 1, P 120-124, 1972. Illus.
Identifiers: *Drainage, Farming, Grassland, *Wet growing, *Herbage growth, *Ireland, Seasons, Soils.

Dry matter production from grassland on a soil with impeded drainage at Castle Archdale, Co. Fermanagh, was substantially reduced in the wet growing seasons of 1965-66. Reductions of the order of 16% were common on fertilized treatments and were as high as 37% on unfertilized treatments. The significance of these results in grassland farming systems is discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-09578

LONG-TERM GRAZING EFFECTS ON STIPA--BOUTELOUA PRAIRIE SOILS.
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 02G.
W73-09579

DEVELOPMENT OF GRASS ROOT SYSTEMS AS INFLUENCED BY SOIL COMPACTION,
Agricultural Research Service, Big Springs, Tex.
D. W. Fryrear, and W. G. McCully.
J Range Manage. Vol 25, No 4, p 254-257, 1972. Illus.
Identifiers: Bouteloua-curtipendula, *Grass roots, *Soil compaction, *Seedlings (Sideout grama).

The roots of 'Premier' sideoats grama (Bouteloua curtipendula (Michx.) Torr.) seedlings do not penetrate a shallow compacted layer the first year. This restrictive layer, commonly found in cultivated fields being converted to grass, can be modified by tillage to permit grass roots to expoit the soil beneath these compacted layers to obtain nutrients and water.--Copyright 1973, Biological Abstracts, Inc.
W73-09580

EFFECT OF SOIL MANAGEMENT ON CORN YIELD AND SOIL NUTRIENTS IN THE RAIN FOREST ZONE OF WESTERN NIGERIA,
Iban Univ. (Nigeria). Dept. of Agronomy.
A. A. Agboola, and A. A. Fayemi.
Agron J. Vol 64, No 5, p 641-644. 1972.
Identifiers: Calopgonium-Muccunoides, Conservation, *Corn yield, Forest zone, *Nigeria, Nutrients, Phaseolus-Aureus, Phosphorus, Potassium, Rain, Crop rotation, *Soil nutrients, Vigna-Sinensis, Zea-Mays, *Leume crops.

An experiment involving both interplanted legume crops in rotation plus fertilizer was conducted in Ibadan, which has an annual rainfall of 140 cm and average temperature of 25 C. The experiment was located on Iwo soil series with unusually high available P (100 kg/ha) and exchangeable K (600 kg/ha), soil pH of 6.5, and cation exchange capacity (CEC) of 15 meq/100g. Fertilizer (55-10-55 kg/ha of N-P-K) increased yields of corn (Zea mays L.)

from 1510 to 2460 kg/ha. Legumes (greengram (Phaseolus aureus), cowpea (Vigna sinensis), and calopo (Calopogonium mucunoides)) either interplanted or rotated also increased the yield of corn. The magnitude of the increase for calopo was equivalent to that for the fertilizer. Legumes tended to conserve available P and exchangeable K in the surface soil.--Copyright 1973, Biological Abstracts, Inc.
W73-09581

SOIL MANAGEMENT FACTORS AND GROWTH OF ZEA MAYS L. ON TOPSOIL AND EXPOSED SUBSOIL,
A. R. Batchelder, and J. N. Jones, Jr.
Agron J. Vol 64, No 5, p 648-652. 1972.
Identifiers: Exposed soils, Fertilizers, *Corn, Growth, Irrigation, Lime, *Soil management, Mulch, Runoff, Soils, Subsoil, Surface tension, Topsoil, Zea-Mays, *Water storage.

Corn (Zea mays L.) was grown for 4 yr on a Groseclose clay loam surface soil and exposed clay subsoil to study the effects of selected management practices on subsoil productivity and the available water storage in exposed subsoils. Half of the exposed subsoil plots were covered with straw mulch, and half of all plots were irrigated. Lime was added the first 2 yr and fertilizer was added each year to alleviate the growth-limiting effects of low pH and low fertility. The treatments were reflected in surface water runoff from the 10-12% slopes, in soil water tension relationships, in plant growth, and in grain yields. Mulching reduced the surface water runoff, resulting in greater net water input. The soil water tensions to a depth of 45 cm were generally lower under the straw mulch without irrigation than with either of the topsoil treatments. Top growth and grain yields generally increased on the subsoil treatments each year, and in the fourth yr yields from the irrigated subsoil without mulch and both the irrigated and nonirrigated subsoil with mulch were equivalent to those of the irrigated topsoil, and significantly greater than those of topsoil without irrigation. In the last 2 yr, when soil tests indicated that the low pH and low fertility had been mitigated, relative yields were markedly affected by the number of days during which the soil water tension at the 45-cm depth exceeded 700 millibar. --Copyright 1973, Biological Abstracts, Inc.
W73-09582

AGRICULTURAL RESPONSE TO HYDROLOGIC DROUGHT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. J. Bidwell.
Colorado State University Press, Hydrology Papers, No 53, July 1972. 25 p, 2 fig, 3 tab, 24 ref.

Descriptors: *Droughts, *Mathematical models, *Least squares method, *Planning, *Crop response, Agriculture, Hydrology, Dry farming, Crop production, Evaluation, Physiological ecology, Plant physiology, Mathematical studies.
Identifiers: Drought prediction.

Of all the detrimental effects ascribed to droughts, the total or partial loss of agricultural production is probably the most serious. Within this context is included both crops for direct harvesting and those sued as pasture for animal grazing. This paper deals with the effects of hydrologic drought on the yield of dryland farming and the evaluation of these effects. Some of the physiological principles involved in crop growth are reviewed in the context of a system which relates reduction in crop production to deficits in the water input. A possible set of non-linear functions is developed to describe this system by using the physical properties of crop production as constraints on the mathematics. The method of non-linear least squares regression is described as a suitable technique for solving the system function. One of the main purposes of the model is to reduce the uncertainty in estimation of the statistical properties of agricultural drought over large areas. Application of the analytical methods to a set of corn yield data is demonstrated with several types of system functions, one of which is suggested as a suitable practical model. The predictability of the models is not high because of restriction imposed by the availability of data. Some improvements are suggested for further development when more suitable data are available. (Black-Arizona)
W73-09678

GREAT BASIN EXPERIMENT STATION COMPLETES 60 YEARS,
Technical Writers' Services, Ogden, Utah.
For primary bibliographic entry see Field 04A.
W73-09681

RICE CALENDAR OF THAILAND,
Meteorological Dept. Bangkok (Thailand).
V. Rasmidatta.
Thai J Agric Sci. Vol 5 No 1, p 63-76 1972.
Identifiers: Armyworm, Bacteria, Diseases, Fungi, Jassids, Mealy bugs, Rainfall, *Rice-M, *Thailand, Thrips.

Rainfall is the most important meteorological factor in rice cultivation in Thailand. Drought from mid-June to July obstructs growth of plants. Flood in Sept. not only damages rice crops directly but also causes the outbreak of climbing cutworms. The infestation of armyworms, thrips, jassids and mealybugs are heaviest in the period of poor rains. Heavy rainfall causes blast, stem rot, collar rot, and oriental sheath and leaf spot diseases. The spread of bacterial leaf stripe diseases is greatest during the storm season, and brown spot during cold spells.--Copyright 1972, Biological Abstracts, Inc.
W73-09682

ARIZONA AGRICULTURE - CURRENT STATUS AND OUTLOOK.
Arizona Univ., Tucson. Coll. of Agriculture.

Arizona Agricultural Experiment Station and Cooperative Extension Service, Bulletin A-74, April 1973. 24 p, 41 fig, 3 tab.

Descriptors: *Arizona, *Agriculture, *Statistics, *Crop production, *Groundwater, Water levels, Pumping, Land use, Livestock, Irrigation.

General topics affecting Arizona Agriculture during 1972 such as the general economy, international trade, farm income, agricultural policies and programs, rural development, water, land use, agricultural credit and purchase inputs are detailed. Trends in specific crops such as sugar beets, safflower and cottonseed, cotton, grains, alfalfa, vegetables and melons, deciduous tree crops, and citrus fruit are analyzed, followed by similar treatment for livestock, including sheep, lambs and wool, hogs, and beef cattle, as well as poultry. Tables display total surface water diversions and groundwater pumping over a 7-year period, 1965-1971, land ownership in Arizona, 1972, and farm and ranch loans in Arizona by lender group over the period 1960-1973. Total water diversions and pumping for the period 1965-1972 were 60.1 million acre-feet, with 90 percent being used in irrigated agriculture. Figures reveal comparative statistics over varying periods of time during the last decade. A companion report, Arizona Agricultural Statistics, is abstracted separately. (Paylore-Arizona)
W73-09686

1972 ARIZONA AGRICULTURAL STATISTICS,.
Arizona Crop and Livestock Reporting Service, Phoenix.

Bulletin S-8, April 1973. 82 p.

Descriptors: *Arizona, *Agriculture, *Statistics, Field crops, Vegetable crops, Precipitation (Atmospheric), Livestock, *Water supply, Forecasting, *Reservoir storage, Snow cover, Soil moisture.

The 8th edition of this cooperative program to collect, analyze, and publish agricultural statistics for Arizona. In largely tabular form statistics are presented on field crops (cotton, barley, sorghum, wheat, corn, hay, safflower, and sugarbeets), vegetables, fruit, cattle, cattle on feed, hogs, sheep, poultry, honey and beeswax. Information is given on planting and harvesting dates, cash receipts (both state and county summaries), land status, Arizona water supply outlook, and principal crops by counties. Available reports issued by the Service are listed. The water supply outlook includes data on reservoir storage for both the Gila River and Colorado River drainages, snow cover, precipitation, and soil moisture. A companion report, Arizona Agriculture: Current Status and Outlook, is abstracted separately. (Paylore-Arizona)
W73-09687

WATER CONSERVATION AND IRRIGATION AGENCIES.
For primary bibliographic entry see Field 06E.
W73-09716

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

HYDROLOGIC SIMULATION OF DEPRESSIONAL WATERSHEDS,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 02A.
W73-09101

MATHEMATICAL MODEL FOR SCREENING STORM WATER CONTROL ALTERNATIVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 05B.
W73-09119

A BAYESIAN APPROACH TO AUTOCORRELATION ESTIMATION IN HYDROLOGIC AUTOREGRESSIVE MODELS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 02A.
W73-09120

EXPERIMENTAL STUDY OF UNDERGROUND SEEPAGE TOWARD WELLS,
Rhode Island Univ., Kingston. Dept of Engineering.
For primary bibliographic entry see Field 05B.
W73-09131

SUBSURFACE DRAINAGE SOLUTIONS BY GALKERIN'S METHODS,
Colorado State Univ., Fort Collins. Dept of Civil Engineering.
P. Dass, and H. J. Morel-Seytoux.
Paper to be published in ASCE Proceedings, Journal of Irrigation and Drainage Division, September, 1972. 40 p, 13 fig, 3 tab, 13 ref, 3 append.

Descriptors: *Drainage, *Drawdown, *Groundwater movement, Mathematical studies, Com-

puter programs, Soil water movement, Water levels, Darcys law, Dupuit-Forchheimer theory, Hydraulic conductivity, Saturated flow, Unsaturated flow.
Identifiers: *Boussinesq equation, *Galerkins method.

A variation of Galerkin's method is used to solve the nonlinear Boussinesq equation for drainage problems. This solves a difficulty of the linearized method, in which the ratio of drawdown to aquifer depth becomes large and designs are optimistic. Design criteria based on the linearized Boussinesq equation overestimates the rate of drainage for two reasons: (1) they do not account for important nonlinear effects; and (2) they do not account for the delaying effect of the unsaturated flow condition above the water table. The use of Galerkin's method accounts for the nonlinear effect which is quite significant. This is illustrated on a design example (Knapp-USGS)
W73-09132

POSSIBLE WAYS OF DEVELOPING IRRIGATED AGRICULTURE IN SOVIET CENTRAL ASIA AND THE FUTURE OF THE ARAL SEA (VOZMOZHNYYE PUTI RAZVITIYA OROSHAYEMOGO ZEMLEDELIYA SREDNEY AZII I BUDUSHCHEYE ARAL'SKOGO MORYA),
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
For primary bibliographic entry see Field 03F.
W73-09155

STRUCTURE OF WATER CONSUMPTION IN THE UNITED STATES AND ITS SPATIAL CHARACTERISTICS (STRUKTURA VODOPOTREBLENIYA V SSHA I YEYE TERRITORIAL'NYYE OSOBENNOSTI),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 06D.
W73-09156

THE EIGHTEENTH INTERNATIONAL LIMNOLOGY CONGRESS AT LENINGRAD (XVIII MEZHDUNARODNYY LIMNOLOGICHESKIY KONGRESS V LENINGRADE),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02H.
W73-09159

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3, OHIO RIVER BASIN--VOLUME 2, OHIO RIVER BASIN FROM KANAWHA RIVER TO LOUISVILLE, KENTUCKY.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09160

HYDROLOGY AND EFFECTS OF CONSERVATION STRUCTURES, WILLOW CREEK BASIN, VALLEY COUNTY, MONTANA, 1954-68,
Geological Survey Washington, D.C.
D. G. Frickel.
Available from Sup Doc, GPO, Washington, D.C. 20402. Price 30 cents. Geological Survey Water-Supply Paper 1532-G, 1972. 34 p, 14 fig, 8 tab, 10 ref.

Descriptors: *Hydrology, *Water control, *Reservoirs, *Montana, *Runoff, Sediment yield, Water spreading, Water conservation, Hydrologic data, Vegetation, Soils, Topography, Climate, Precipitation (Atmospheric), Environmental effects, Watershed management.
Identifiers: *Willow Creek Basin (Mont).

Results of hydrologic observations in Willow Creek basin in northeastern Montana are presented for the period 1954-68. Frequency curves for runoff and precipitation are provided. The average annual precipitation for the 14-year period 1954-67 was about 0.5-inch less than the 30-year average; also, the average for the first half of the period was 3.4 inches less than that for the second half. The average seasonal runoff volume measured at Northwest Burnett, Cactus Flat, and Sheepshed reservoirs was 93.9, 96.5, and 37.5 acre-feet per square mile, respectively, for the 10-year period 1958-67. Sediment yields from Northwest Burnett, Cactus Flat, Sheepshed, and Triple Crossing basins varied from 0.1 to about 2.0 acre-feet per square mile. During the study period numerous reservoirs and waterspreaders were constructed in the basin. This upstream regulation of flow has caused a decrease in both the channel dimensions and the suspended-sediment load at the gaging station near the mouth of the basin. The peak stream discharge recorded at the gaging station is estimated to be about 45% less than it would have been had no reservoirs or waterspreaders been in the basin. The annual runoff volume recorded at the gaging station is estimated to be 18% less than it would be if the basin were totally uncontrolled. The capacity of the reservoir system is being reduced at an estimated rate of 1.6%, owing to sedimentation. (Woodard-USGS)
W73-09167

PHOSPHATE NUTRITION OF THE AQUATIC ANGIOSPERM, MYRIOPHYLLUM EXALBESCENS FERN.,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 05C.
W73-09201

REMOTE SENSING AS AN AID TO THE MANAGEMENT OF EARTH RESOURCES,
California Univ., Berkeley. Space Sciences Lab.
For primary bibliographic entry see Field 07B.
W73-09262

HYDROLOGY OF SMOOTH PLAINLANDS OF ARID AUSTRALIA.
Department of National Development, Canberra (Australia).
For primary bibliographic entry see Field 07C.
W73-09276

INTERCEPTION LOSS IN LOBLOLLY PINE STANDS OF THE SOUTH CAROLINA PIEDMONT,
Forest Service (USDA), Asheville, N.C. Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 03B.
W73-09383

STUDY FOR DETERMINATION OF SOIL DRAINAGE CLASSES IN THE SOIL SURVEY (IN KOREAN),
Institute of Plant Environment, Suwon (Korea).
For primary bibliographic entry see Field 02G.
W73-09421

INFLUENCE OF LAND-USE ON CERTAIN SOIL CHARACTERISTICS IN THE AFFORESTED AREA OF KHUNTI IN CHOTANAGPUR,
Ranchi Agricultural Coll., Kanke (India).
For primary bibliographic entry see Field 02G.
W73-09424

CLASSIFICATION AND EVALUATION OF FRESHWATER WETLANDS AS WILDLIFE HABITAT IN THE GLACIATED NORTHEAST,
Massachusetts Univ., Amherst. Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-09430

A LOSING DRAINAGE BASIN IN THE MISSOURI OZARKS IDENTIFIED ON SIDE-LOOKING RADAR IMAGERY,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 07B.
W73-09446

GEOLOGY AND LAND RECLAMATION,
Kent State Univ., Ohio. Dept. of Geology.
M. R. McComas.
Ohio J Sci., Vol 72, No 2, p 65-74. 1972. Illus.
Identifiers: Drainage, Flooding, Geology, *Land reclamation, Landslides, Water pollution control.

Expansion of the population in the periphery of urban centers creates increased need for land for food, housing, recreation and waste disposal. As much of land is occupied, derelict lands such as floodplains, swamps and bogs, abandoned mineral working and steep slopes are subjected to reclamation. Reclamation of wetlands for agriculture in north-central USA is accomplished simply by land drainage. Reclamation of derelict land (wetlands, floodplains, stripped land and quarries, and landslide-prone slopes) for municipal, industrial, or residential needs requires study by environmentally oriented scientists as well as engineers, to prevent environmental disruption. In Illinois and Ohio, reclamation or intensive use of some derelict lands has precipitated problems of flooding, surface-water pollution, ground-water pollution, and landslides. Study of the geology and hydrology of the area considered for reclamation prior to construction is highly desirable for making more effective reclamation and for deciding on the best land use after reclamation. Low-intensity land uses such as parks on floodplains, agriculture in old strip-mined areas, and ski runs on unstable slopes may be, at least for the present, the highest value land-uses available for these sites.--Copyright 1972, Biological Abstracts, Inc.
W73-09533

THE RELATION OF FORESTS AND FORESTRY TO WATER RESOURCES,
Georgia Univ., Athens. School of Forest Resources.
J. D. Hewlett.
S Afr For J. 75. p 4-8. 1970. Illus.
Identifiers: Ecology, Erosion, Evaporation, *Forestry management, Forests, *Land management, Water resources, *Water utilization.

The various users and planners of a basin's water resource must recognize and submit to a reasonable distribution of the total water available, taking in account the inevitable surplus and deficit periods, and recognizing both on-site and downstream uses of water as necessary to optimize benefits to the community as a whole. The effects of land use on erosion, evaporation, water yield, and production coefficients for water must be considered if an effective plan for watershed management is ever to be enacted. Therefore, an intensive and well-supported program of research into the hydrologic and ecologic processes in the headwaters should be maintained until all the salient facts are known and agreed on.--Copyright 1972, Biological Abstracts, Inc.
W73-09537

WINTER AND SUMMER GROWTH OF PASTURE SPECIES IN A HIGH RAINFALL AREA OF SOUTHEASTERN QUEENSLAND,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropical Pastures.
M. C. Rees.
Trop Grassl. Vol 6, No 1, p 45-54, 1972.
Identifiers: *Australia (Queensland), Desmodium-Intorum-D, Desmodium-Uncinatum-D, Glycine-Wightii-D, Panicum-Coloratum-M, *Pasture species, Phalaris-M, Rainfall, Setaria-M-Spp, Setaria-Sphacelata-M, Trifolium-Repens-D, *Seasonal growth.

The persistence and seasonal distribution of growth of 134 tropical and temperate grasses and legumes were studied without irrigation over 4 yr in a high rainfall area. Grasses were heavily fertilized with N in addition to the molybdenized superphosphate which was applied to all species tested. Most tropical grasses were capable of high summer dry matter production, but Setaria spp. and Panicum coloratum (Kabulabuia) appeared most suitable, combining persistence with production. Setaria sphacelata CPI 33452 from which Narok setaria was selected, persisted better and gave higher winter dry matter yields than Nandi and Kazungula setaria and most temperate grasses. Nandi setaria survived only when no N was applied in winter. Following winter rains, temperate grasses outyielded setaria and are probably superior for winter production where irrigation is available. Phalaris hybrid was the only temperate grass to persist for 4 yr. Silverleaf desmodium (Desmodium uncinatum) and Cooper glycine (Glycine wightii) were the most persistent of the 31 tropical legumes tested and silverleaf desmodium and greenleaf desmodium (D. intortum) were the highest yielding. Of 53 temperate legumes tested ladino and Louisiana white clovers (Trifolium repens) were the best. Annual legumes failed to reestablish in the second season due to competition from existing naturalized white clover.--Copyright 1972, Biological Abstracts, Inc.
W73-09545

ECOLOGY OF PASTORAL AREAS IN THE ARID ZONE OF RAJASTHAN.
Central Arid Zone Research Inst., Jodhpur (India).
R. K. Gupta.
Ann Arid Zone. Vol 10, No 3, p 136-157, 1971. Illus.
Identifiers: Animals, Arid zones, Climates, Drought, *Ecology, Grassland, *India (Rajasthan), Land, Management, *Pastoral population, Range, Soils, Stocking.

The area, land use and climate of pastoral areas of arid Rajasthan are reviewed, Grasslands are divided into ephemeral drought evading, perennial drought evading, perennial drought resistant, and perennial drought resisting semi-succulent types. The distribution of the main grassland types with regard to climate and soil types is discussed. The interrelation of grassland, animal population and stocking rate is given. Suggestions for collecting data on consumers of the native vegetation and decomposers are highlighted for a better understanding of the range ecosystem in the arid regions of Rajasthan.--Copyright 1972, Biological Abstracts, Inc.
W73-09550

RICE RESEARCH IN FIJI, 1960-1970: III. WEED CONTROL,
Department of Agriculture, Suva (Fiji). Research Div.
For primary bibliographic entry see Field 03F.
W73-09569

GENERAL REPORT ON WATER RESOURCES SYSTEMS: OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 02A.
W73-09588

MAKARA, IHD EXPERIMENTAL BASIN NO 6, 1968-1970,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 02A.
W73-09596

MOUTERE, IHD EXPERIMENTAL BASIN NO 8, 1971,
National Water and Soil Conservation Organization, Wellington (New Zealand).
For primary bibliographic entry see Field 02A.
W73-09597

APPRAISAL OF THE WATER AND RELATED LAND RESOURCES OF OKLAHOMA.
Oklahoma Water Resources Board, Oklahoma City, Region Ten.

Available from NTIS, Springfield, Va 22151 COM-72 11470 Price $3.00 printed copy; $0.95 microfiche. Publication No 40, 1972. 137 p.

Descriptors: *Water resources, *Land development, *Oklahoma, *Water quality, *Water utilization, Streamflow, Groundwater, Hydrology, Climatology, Flood control, Watershed management, Geology, Economics, Oil, Recreation, Wildlife conservation, Water demand.

This is the ninth in a series of 12 reports which are part of the first phase of gathering information basic to the eventual Oklahoma statewide water plan. Region X in north central Oklahoma definitely has water problems; even in areas where water is available, quality is often too poor to allow use for beneficial purposes. Various aspects of the needs and assets of this area are described and discussed. Information is given on the geology, soils, hydrology, climatology, surface water, watershed protection and flood prevention, groundwater water quality, agriculture, manufacturing and industry, oil and gas, power and fuel, and recreation and wildlife. Maps, charts and tables provide data summaries for the region. (Woodard-USGS)
W73-09599

COMPUTER MODEL FOR DETERMINING BANK STORAGE AT HUNGRY HORSE RESERVOIR, NORTHWESTERN MONTANA,
Geological Survey, Menlo Park, Calif.
T. H. Thompson.
Open-file report, 1972. 33 p, 7 fig, 4 tab, 8 ref.

Descriptors: *Bank storage, *Reservoirs, *Montana, *Simulation analysis, Computer programs, Mathematical models, Surface-groundwater relationships, Water yield.
Identifiers: *Hungry Horse Reservoir (Mont).

A mathematical model computes bank storage at Hungry Horse Reservoir in northwestern Montana. The model uses daily reservoir elevations as input. Monthly accumulated bank-storage volumes for the period October 1951 through September 1972 were calculated. About 5.8% of the usable reservoir storage volume would be available from bank storage for at-site power generation and downstream benefits if the reservoir were subjected to a long term, cyclic drawdown. The model is most sensitive to changes in aquifer width on an annual basis and to changes in the storage coefficient on a seasonal basis. The computer model can be used to compute bank-storage volumes whenever historical or assumed elevations are available for Hungry Horse Reservoir. The parameters can be changed to estimate bank-storage volumes at other reservoirs having similar geologic, physiographic, and hydrologic conditions. (Knapp-USGS)
W73-09600

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-09603

AN ECONOMIC APPROACH TO LAND AND WATER RESOURCE MANAGEMENT: A REPORT ON THE PUGET SOUND STUDY,
Washington Univ., Seattle. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W73-09646

GREAT BASIN EXPERIMENT STATION COMPLETES 60 YEARS,
Technical Writers' Services, Ogden, Utah.
W. M. Keck.
Journal of Range Management, Vol 25, No 3, May 1972, p 163-166. 4 fig.

Descriptors: *Watershed management, *Range management, *Climatology, *Planting management, *History, Summer, Floods, Air temperature, Precipitation (Atmospheric), Evaporation, Pressure, Wind velocity, Rainfall, Runoff, Vegetation, Erosion, Sediments, Storms, Revegetation, Ecosystems, Environmental effects, Semiarid climates, *Utah, Great Basin.

The Great Basin Experimental Range in Utah completed 60 years of continuous ecological research in 1972. Research pioneered include watershed management, range management, climatology and plant ecology. A history of the Experiment Station is reviewed in brief. The Station was established in 1912 in response to damages caused by summertime floods in the West. Climate studies include collection and interpretation of air temperature, sunshine, precipitation, evaporation, barometric pressure and wind velocity data. Watershed studies include monitoring rainfall, runoff and vegetatal cover relations with regard to erosion and sediment production due to high intensity summer storms. Plant studies include revegetation efforts and planting management. Aspen studies and game range restoration are also performed by the Station. The role of range science in ecological and environmental research is summarized. (Popkin-Arizona)
W73-09681

FACTORS INFLUENCING INFILTRATION AND EROSION ON CHAINED PINYON-JUNIPER SITES IN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 02G.
W73-09684

EXPERIENCE IN USING HERBICIDE SIMAZINE FOR CONTROLLING PLANTS IN WATER BODIES, (IN RUSSIAN),
T. A. Oktyabr'skaya, and I. G. Shishkov.
Med Parazitol Parazit Bolezn. Vol 41 No 1, p 64-66, 1972. English summary.
Identifiers: Duckweed-M, *Herbicides, Horsetail-P, Mace-M, Reeds, *Simazine, Water pollution control, *Weed control.

A greater part of the vegetation was controlled by simazine in 3-6 wk. The following year partial overgrowth occurred predominantly with duckweed, as well as with reedmace and horsetail. Summer treatment was more effective during the period of active growth of hydrophytes. For destruction of the latter in summer a dose of 10 kg/ha was calculated for the active substance (20 kg/ha of 50% moistened powder). A repeated treatment in the season is required for elimination of perennial herbs. When the compound is used in early spring, its dosage should be increased to 12-15 kg/ha. Granulated form is particularly effective. Treatment of water bodies may be done both with hand-operated sprayer and mechanical sprayers. Particularly convenient is MRZh-12 sprayer mounter on a lorry.--Copyright 1972, Biological Abstracts, Inc.
W73-09685

WAHKIAKUM COUNTY CONSOLIDATED DIKING DISTRICT NO. 1, WAHKIAKUM

COUNTY, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W73-09697

PROSPERITY LAKE, SPRING RIVER AND TRIBUTARIES, MISSOURI-KANSAS-OKLAHOMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W73-09698

LOCAL PROTECTION PROJECT, LOG JAM REMOVAL ON SALAMONIE RIVER NEAR BLUFFTON IN WELLS COUNTY, INDIANA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Louisville, Ky.

Available from National Technical Information Service, U.S. Dept. of Commerce, EIS-IN-72-5766-F, for $3.50 paper copy, $0.95 microfiche. October 5, 1972. 21 p, 1 map.

Descriptors: *Indiana, *Environmental effects, *Water management (Applied), *Flood protection, Navigable waters, Public health, Silting, Lumbering, Relocation, Environmental control, Human diseases, Water pollution, Wood wastes, Decomposing organic matter, Flood control, Water utilization, Project planning, Project feasibility.
Identifiers: *Environmental impact statement, *Log jams, Wells Co. (Ind.), Debris.

The proposed plan is a small flood protection project consisting of the removal and disposal of two log jams from the Salamonie River, Indiana, between mile 43 and mile 46, in, and upstream from, Section 13, Township 25 North, Range 10 East, Wells County, Indiana. The project will reduce flooding due to the damming effect of the log jams, eliminate the threat to two bridges on 600 West Road over the Salamonie River, and eliminate health hazards due to carcasses and other decaying debris lodged in the jam. Extraction of this log jam will require the temporary disruption of approximately 1000 feet of normally freeflowing stream, destruction of vegetation along one side to provide access for machinery, cause some temporary silting of the river, and will require the temporary use of 5 acres of land adjacent to the river for about 8 years for natural decomposition of the material. Alternatives considered included extracting the driftwood, depositing the debris on adjacent high ground, and burning it in the resulting window; doing nothing and allowing the stream to proceed with natural relocation; and, accelerating relocation by channel excavation. Comments of interested state and federal agencies are included. (Mockler-Florida)
W73-09700

THE BEACHES: PUBLIC RIGHTS AND PRIVATE USE (PROCEEDINGS OF A CONFERENCE).
Texas Law Inst. of Coastal and Marine Resources, Houston.
For primary bibliographic entry see Field 06E.
W73-09701

OMNIBUS WATER RESOURCES AUTHORIZATIONS--1972, PARTS I AND II.
For primary bibliographic entry see Field 06E.
W73-09709

PUBLIC ACCESS TO RESERVOIRS TO MEET GROWING RECREATION DEMANDS.
For primary bibliographic entry see Field 06E.
W73-09710

CONSERVANCY DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-09721

INDIANA DRAINAGE CODE--DRAINAGE BOARDS--POWERS AND DUTIES.
For primary bibliographic entry see Field 06E.
W73-09725

DRAINAGE, SYSTEM OF COUNTY DRAINAGE.
For primary bibliographic entry see Field 06E.
W73-09739

4B. Groundwater Management

WATER QUALITY AS RELATED TO POSSIBLE HEAVY METAL ADDITIONS IN SURFACE AND GROUNDWATER IN THE SPRINGFIELD AND JOPLIN AREAS, MISSOURI,
Missouri Water Resources Research Center, Rolla.
For primary bibliographic entry see Field 05A.
W73-09104

THE TRANSIENT BEHAVIOR OF RECHARGE--DISCHARGE AREAS IN REGIONAL GROUNDWATER SYSTEMS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W73-09105

PROCEEDINGS OF CONFERENCE ON TOWARD A STATEWIDE GROUNDWATER QUALITY SUBCOMMITTEE CITIZENS ADVISORY COMMITTEE, GOVERNORS ENVIRONMENTAL QUALITY COUNCIL.
For primary bibliographic entry see Field 05B.
W73-09113

GROUND-WATER LEVELS IN THE LOWER ARKANSAS RIVER VALLEY OF COLORADO, 1969-73,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-09123

APPRAISAL OF GROUNDWATER FOR IRRIGATION IN THE LITTLE FALLS AREA, MORRISON COUNTY, MINNESOTA,
Geological Survey, Washington, D.C.
J. O. Helgesen.
Geological Survey Water-Supply Paper 2009-D, 1973. 40 p, 19 fig, 1 plate, 4 tab, 17 ref.

Descriptors: *Groundwater resources, *Minnesota, *Glacial drift, Groundwater, Hydrogeology, Aquifers, Water yield, Safe yield, Model studies, Analog models.
Identifiers: *Morrison County (Minn).

Geologic conditions cause groundwater availability to vary widely in the area near Little Falls, Morrison County, Minnesota. The largest and most readily available groundwater source is the glacial outwash sand and gravel from which the soils were derived. Saturated outwash is as much as 50-100 feet thick where the outwash fills a probable former melt-water channel. Transmissivity of the thicker parts of the aquifer approaches or exceeds 100,000 gallons per day per foot, and probable well yields should exceed 1,000 gallons per minute. In about two-thirds of the study area, a saturated thickness of less than 40 feet generally limits well yields to less than 300 gallons per minute. Response to pumping was studied through electric analog analyses by stressing the model aquifer system in accordance with areal variations in expected well yields. Most of the sustained pumpage would be obtained from intercepted base flow and evapotranspiration. Simulated withdrawals totaling 18,000 acre-feet of water per year for 10 years resulted in little adverse effect on the aquifer system. Simulated larger withdrawals, assumed to represent denser well spacing, caused greater depletion (excessive in some areas) of aquifer storage, streamflow, and lake volumes. (Knapp-USGS)
W73-09126

GROUNDWATER RESOURCES OF THE NORCO AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
R. L. Hosman.
Louisiana Geological Survey and Department of Public Works Water Resources Bulletin, No 18, 1972. 61 p, 7 fig, 3 plate, 1 tab, 19 ref.

Descriptors: *Groundwater resources, *Water wells, *Hydrogeology, *Water quality, *Louisiana, Groundwater movement, Pumping, Water yield, Water utilization, Chemical analysis, Groundwater recharge, Gulf of Mexico, Mississippi River, Aquifer characteristics, Data collections, Hydrologic data, Saline water intrusion, Maps, Saline water-freshwater interfaces.
Identifiers: *Norco area (La).

The Norco area, Louisiana, a site of industrial development on the Mississippi River east of New Orleans, is hydrologically complex. The hydraulic interplay between the major aquifers and the Mississippi River offers possibilities for areal or regional water-management planning, and much of the potential of the aquifer system has already been demonstrated. Relations between freshwater and saltwater in the area are ever changing because of water movement generated by heavy pumping. Salty water is moving into the Norco aquifer from the Gramercy aquifer through the convergence. This salty water is, in turn, being replaced by fresh, very hard water moving into the Gramercy aquifer through contact with the Mississippi River via point-bar deposits. A sizable area in the Gramercy aquifer had already been flushed in this manner, and this water will eventually reach the Norco aquifer is present pumping is continued. Total groundwater pumpage in the area is about 16 million gallons per day. Most of the water is brackish or salty and is used for cooling purposes. The Norco aquifer yields about 9.5 million gallons per day and is capable of yielding much more and fresher water. (Woodard-USGS)
W73-09128

RESPONSE OF KARST AQUIFERS TO RECHARGE,
Agricultural Research Service, Athens, Ga. Southeast Watershed Research Center.
For primary bibliographic entry see Field 02F.
W73-09129

EXPERIMENTAL STUDY OF UNDERGROUND SEEPAGE TOWARD WELLS,
Rhode Island Univ., Kingston. Dept of Engineering.
For primary bibliographic entry see Field 05B.
W73-09131

SAFE YIELD IN WEST MAUI BASAL AQUIFERS,
Hawaii Univ., Honolulu.
F. L. Peterson.
Termination Report, 1972. 2 p, 2 ref. OWRR A-033-HI- (1).

Descriptors: *Groundwater, *Water supply, *Safe yield, *Hawaii, *Aquifers, Mathematical models, Equations, Water yield, Groundwater recharge, Correlation analysis, Evaluation, Groundwater movement.
Identifiers: West Maui Basal Aquifers (Hawaii).

To estimate recharge and safe yield of the Waikapu basal aquifer of West Maui, Hawaii, a correlation was made between rainfall, draft, and head changes for use on basal aquifers on Oahu, Hawaii, in the vicinity of Honolulu. Draft is correlated with a rainfall index, head, and three coefficients. Loss is proportional to the first power of the head, and there is a gain or loss proportional to the first power of the function of rainfall, in values which fluctuate on either side of zero depending on whether the rainfall accumulation is excessive or deficient. Thus, the equation is a linear regression of draft on the values for head and for rainfall. (Woodard-USGS)
W73-09135

ARTIFICIAL RECHARGE IN THE WATERMAN CANYON-EAST TWIN CREEK AREA, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. W. Warner, and J. A. Moreland.
Geological Survey open-file report, November 16, 1972. 26p, 13 fig, 2 plate, 7 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Imported water, *California, Feasibility studies, Test wells, Aquifer characteristics, Faults (Geologic), Hydrogeology, Groundwater movement, Water level fluctuations, Infiltration rates, Hydrologic data.
Identifiers: *San Bernardino (Calif), Waterman Canyon (Calif), East Twin Creek area (Calif).

The feasibility of recharging 30,000 acre-feet a year of imported water from northern California in the Waterman Canyon-East Twin Creek area in San Bernardino County, Calif., will depend on the effectiveness of fault K as a barrier to groundwater movement near the land surface. Fault K, about three-fourths of a mile southwest of the south branch of the San Andreas fault, is nearly parallel to the San Andreas fault. This fault is not evident from surface expression but is postulated from geophysical and water-level data. Results of test drilling and infiltration tests reveal that the subsurface material at the spreading grounds is permeable enough to allow recharged water to percolate to the water table. Data indicate that fault K extends into the Waterman Canyon-East Twin Creek area and may impede the lateral movement of recharged water. Fault K has no known surface expression and therefore probably does not affect the highly permeable younger alluvium. If that is so, fault K will be less effective as a barrier to groundwater movement as the recharge mound rises. (Woodard-USGS)
W73-09140

AQUIFER TEST, SOLDOTNA, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
G. S. Anderson.
Geological Survey open-file report, April 1972. 17 p, 3 fig, 8 tab.

Descriptors: *Groundwater resources, *Test wells, *Pumping, *Hydrologic data, *Alaska, Water wells, Water yield, Groundwater recharge, Aquifer characteristics, Groundwater movement, Driller s logs, Drawdown, Well data.
Identifiers: *Soldotna (Alaska).

The results of an aquifer test on a production well drilled by Soldotna Drilling Company for the city of Soldotna, Alaska, are presented. The well was tested on July 23, 1971, by Adams, Corthell, Lee, Wince and Associates. The U.S. Geological Survey, in cooperation with the city of Soldotna and the Kenai Penisula Borough, assisted in the test as a part of a boroughwide water-resources study. Drawdown and recovery data obtained by measuring water levels in the Parker well and the Soldotna test well during and following the pumping period are plotted against time on logarithmic paper. The geologic and hydrologic setting of the Soldotna test well and the results of the aquifer test indicate leaky artesian conditions. The production well is deriving water from storage in the main aquifer, storage in the semiconfining units, and induced leakage through the semiconfining units. The values of the leakage and storage parameter, the transmissivity, and storage coefficient of the main aquifer are summarized. (Woodard-USGS)
W73-09143

PLANNING AND DEVELOPING GROUND WATER SUPPLIES,
Dames and Moore, Inc., New York.
R. B. Ellwood, and J. M. Heckard.
Engineering Bulletin No 35, p 1-4, 1969. 3 fig.

Descriptors: Wells, Water wells, Groundwater, *Water utilization, *Planning, *Groundwater availability, Water quality, Exploration, Surveys, Data collections, Aquifer testing, Pump testing, Hydrologic properties.
Identifiers: Well development, Well design, Exploration boring.

Wells and ground water supply systems are shown to present a number of problems which have to be analyzed carefully to enable an optimum use of a ground water resource and an optimum design of a well system. It is demonstrated that the knowledgeable consultant, familiar with the basic principles of ground water occurrence, can be of considerable help to his clients in developing the most suitable, most economical source of water supply. Four phases of ground water supply investigations are outlined, showing successive stages: reconnaissance, survey, exploration, testing, development, design and installation, rehabilitation, and maintenance. Emphasis is placed on good design, since the cost of proper design, high-quality materials, correct installation, and development is repaid many times over because of the resulting lower costs of long-term pumping. It is also emphasized that close attention to drilling techniques, methods of setting well screens, and developing the wells can make the difference between the mediocre well and an excellent well. (Campbell-NWWA)
W73-09243

WATER SUPPLY AND GROUND WATER UTILIZATION IN FOREIGN COUNTRIES,
Dames and Moore, Salt Lake City, Utah.
W. E. Mead.
Engineering Bulletin No 35, p 5-7, 1969. 4 fig.

Descriptors: Wells, Water wells, Africa, Asis, South America, Urban hydrology, Water supply, *Water resources development, Water treatment, United Nations, Surveys, *Population.
Identifiers: *Developing countries, World Health Organization.

Study by the World Health Organization revealed serious need for expanded water supplies. Population projections indicate that, although not an immediate threat, a point will ultimately be reached when all of the easily available, usable fresh water in the world will have been developed. Present urban water supply conditions in developing countries as rated by WHO regional offices show that most countries studied have unsatisfactory to grossly unsatisfactory water supplies. Although sometimes these conditions have resulted from inadequate distribution systems, it is shown that most often the quantity of water available is either unknown or the water resource has not been developed to a sufficient degree. It is further alleged that the exploitation of ground water resources by industry, municipalities, and agriculture has barely begun throughout the world. A basic premise is that large underground reserves of water can be used directly, with little or no treatment, and that large production wells, though expensive, are usually cheaper than the treatment of contaminated surface water. (Smith-NWWA)
W73-09244

WATER WELL CONSTRUCTION AND DESIGN,
Dames and Moore, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W73-09245

EVALUATING AND MANAGING GROUND WATER SUPPLIES WITH MODELS AND COMPUTERS,
Dames and Moore, Los Angeles, Calif.
J. R. Mount.
Engineering Bulletin 35, p 16-19, 1969. 3 fig.

Descriptors: Model studies, Groundwater, *Groundwater availability, Aquifer characteristics, *Aquifer management, Computers, *Computer models, Pump testing, Water supply, Theis equation, Drawdown, Well spacing.
Identifiers: *Ground water management, *Electric analog models.

In planning a water supply system, great pains may be taken with almost every aspect of the development; but all too often one critical element is overlooked. This is the crucial factor of water supply dependability - the capacity to sustain the long-term demand. In the investigation planning, and maintenance of reliable water supplies, a preliminary estimate of the available ground water supply - subsequently refined by application of collected data - is extremely valuable. The importance of periodically reviewing and appraising collected data in order to learn more about an aquifer is emphasized. Predicting the changes in water levels in response to pumping through the use of models is explained. Models are designed to establish a reasonable correspondence between their properties and those of the prototype aquifers; they can simulate ground water flow, storage, recharge, pumping, natural discharge, and impervious boundaries. (Smith-NWWA)
W73-09246

DEEP WELL INJECTION OF LIQUID WASTS,
Dames and Moore, New York.
For primary bibliographic entry see Field 05G.
W73-09247

ARSENIC INTOXICATION FROM WELL WATER IN THE UNITED STATES,
Minnesota Dept. of Health, Minneapolis.
For primary bibliographic entry see Field 05B.
W73-09248

CEMENTING GEO-THERMAL STEAM WELLS.
Dow Chemical Co., Tulsa, Okla. Dowell Div.
For primary bibliographic entry see Field 08F.
W73-09252

GROUNDWATER HYDRAULICS OF EXTENSIVE AQUIFERS,
J. H. Edelman.
International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, 1972. 216 p.

Descriptors: Groundwater, *Groundwater movement, Porous media, *Hydraulics, Aquifers, Mathematical studies, *Mathematical models, Aquifer characteristics, Engineering geology, *Numerical analysis.
Identifiers: *Groundwater hydraulics, Schematized models, Laws (Physical).

A series of strongly schematized problems is analyzed with a view to applying the results in groundwater engineering. Mathematical derivations are given in full, starting from the fundamental physical laws. As a rule, a problem is discussed in four stages: posing the problem, formulating the solution, deriving the formulae and analyzing the result. The term extensive aquifers is used to denote aquifers whose horizontal dimensions are

much larger than their thicknesses, so that the losses of head due to the vertical velocity components may be neglected. Although no reference is made to the original publications, since foreign elements have not been presented in the form chosen by the authors, a list of modern books is added, to be used for further study as well as for detailed reference. (Smith-NWWA)
W73-09263

RURAL WATER SYSTEMS PLANNING AND ENGINEERING GUIDE,
National Water Well Association, Columbus, Ohio.
M. D. Campbell, and J. H. Lehr.
Commission on Rural Water, Washington, D.C., 1973. 150 p, 62 fig, 22 tab, 73 ref.

Descriptors: *Water supply development, Water consumption, Water demand, *Water delivery, Water pressure, Water purification, Disinfection, Water softening, Water Tanks, *Water treatment, *Water wells, Pumps, Pumped storage, *Rural areas, Maintenance, Cost analysis, Distribution systems, Groundwater, Groundwater availability, Surface water availability.
Identifiers: Engineering guides, Rural water.

Written as an information source for project directors, engineering consultants, and federal, state, and local authorities in the development of successful rural water supply systems, this book is intended to enable project directors and engineering consultants to work together more effectively to provide economically feasible and hygienically acceptable water supply systems for rural people. The overall problem of rural water system planning and development is discussed in Chapter One. In Chapters Two through Five, the essentials of water system development are examined; well site selection and well construction, requirements for pumping facilities, water treatment, and storage and distribution systems. Cost analyses and comparisons for obtaining a water supply from both ground water and surface water sources and for the treatment necessary for each are presented in Chapter Six. The final chapter provides general guidelines necessary for adequate well and water system maintenance, giving special attention to trouble shooting commonly used jet and submersible pump systems. (Smith-NWWA)
W73-09265

GROUND-WATER LEVELS IN THE SOUTH PLATTE RIVER VALLEY OF COLORADO, SPRING 1973,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-09280

HYDROLOGY OF THE MARTINSBURG FORMATION IN LEHIGH AND NORTHAMPTON COUNTIES, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02F.
W73-09286

GEOHYDROLOGY OF THE NEEDLES AREA, ARIZONA, CALIFORNIA, AND NEVADA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-09287

MICROBIOLOGICAL ASPECTS OF GROUND--WATER RECHARGE--INJECTION OF PURIFIED UNCHLORINATED SEWAGE EFFLUENT AT BAY PARK, LONG ISLAND, NEW YORK,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W73-09292

CHANGE IN POTENTIOMETRIC HEAD IN THE LLOYD AQUIFER, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
G. E. Kimmel.
Journal of Research of the U S Geological Survey, Vol 1, No 3, p 345-350, May-June 1973. 6 fig, 18 ref.

Descriptors: *Water levels, *Drawdown, *New York, *Aquifers, *Water yield, *Withdrawal, Artesian aquifers, Leakage, Saline water intrusion, Hydrogeology.
Identifiers: *Long Island (NY).

The potentiometric surface of the Lloyd aquifer in 1970 locally was as much as 40 feet lower than in 1900. During this period, withdrawal of water from wells was estimated to exceed 300 billion gallons, and the amount of water released from aquifer storage by compressive forces was estimated to be 1.6 billion gallons (about 0.5% of the withdrawal). The remainder of the withdrawal was derived from downward leakage through overlying aquifers and confining layers and by the displacement of freshwater in the aquifer by landward movement of salty groundwater. (Knapp-USGS)
W73-09293

EVALUATING THE RELIABILITY OF SPECIFIC-YIELD DETERMINATIONS,
Geological Survey, Tucson, Ariz.
R. L. Hanson.
Journal of Research of the U S Geological Survey, Vol 1, No 3, p 371-376, May-June 1973. 5 fig, 2 tab, 12 ref.

Descriptors: *Specific yield, *Drawdown, *Soil water movement, *Aquifer testing, *Moisture content, Storage coefficient, Infiltration, Percolation, Unsaturated flow, Saturated flow, Water level fluctuations.

The specific yield of the alluvial aquifer in the Gila River flood plain in southeastern Arizona was determined using both the time-drawdown method and the soil-moisture-content method. Time-drawdown data measured at 17 observation wells during a 3.5-day aquifer test define an average apparent specific yield of 0.13. Soil-moisture-content data measured at nine access holes during the aquifer test indicated that complete gravity drainage had not been attained in the cone of depression by the end of the drawdown period. The moisture-content data were therefore extrapolated with time to define an average specific yield in the range 0.13 to 0.15. The results obtained by the two methods are in close agreement. However, the significantly lower standard deviation of the results from the moisture-content analysis indicates that extrapolation of the apparent values derived by this method may provide a more reliable estimate of the true specific yield than the apparent values derived by the time-drawdown method. Reliable estimates of specific yield in the zone of seasonal water-level fluctuations are also possible from an evaluation of the soil-moisture change in the spring and summer recession period. (Knapp-USGS)
W73-09297

MANAGEMENT OF GROUND WATER,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
L. K. Fischer.
Nebraska Journal of Economics and Business, Vol 11, No 3, p 23-32, Summer, 1972.

Descriptors: *Optimum development plans, *Water supply development, Irrigation water, Aquifers, Water management (Applied), Benefits, Economic feasibility, *Nebraska.
Identifiers: Stock, Flow, Institutional framework, Incentives.

Using empirical data from Nebraska, groundwater management is considered primarily in terms of irrigation, since 80 percent of the groundwater withdrawn from aquifiers in Nebraska is used for this purpose. However, the principles discussed are peculiar neither to Nebraska nor to irrigation. On the contrary, they generally apply wherever the rate of recharge, natural or induced, is substantial but less than the expected rates of withdrawal. It was assumed that development of water is justified only to the extent that utilization will yield net benefits, and the objective of the utilization of water is to maximize over time the total net benefits derived. Analysis of the history of the present system of incentive and restraints for the development of groundwater and of projections for development over the next decade, however, indicate that this objective can only be achieved by rapidly developing an effective institutional framework for public intervention. This public policy would place restraints on the current rates of development which, if unhindered, will lead to inevitable and substantial overdevelopment. Such overdevelopment, though beguiling in the short run, would be inimical to the public interest in the long run. (Weaver-Wisconsin)
W73-09413

DISTORTION OF THE GEOTHERMAL FIELD IN AQUIFERS BY PUMPING,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-09442

GEOLOGY AND GROUND-WATER RESOURCES OF PRATT COUNTY, SOUTH-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
D. W. Layton, and D. W. Berry.
Kansas Geological Survey Bulletin 205, February 1973. 33 p, 15 fig, 8 tab, 47 ref.

Descriptors: *Groundwater resources, *Water quality, *Basic data collections, *Geology, *Kansas, Water wells, Aquifer characteristics, Withdrawal, Water utilization, Groundwater movement, Groundwater recharge, Streams, Surface-groundwater relationships, Topography, Water analysis, Chemical analysis, Mineralogy, Hydrology, Irrigation.
Identifiers: *Pratt County (Kans).

A continuing program of groundwater investigations was begun in 1937 to define and describe the occurrence, availability, and chemical quality of groundwater in Kansas. Pratt County comprises an area of 729 square miles in south-central Kansas. The county is underlain by unconsolidated deposits of Pleistocene age that, in some areas, could yield as much as 3,000 gallons of water per minute to wells. About 26,000 acre-feet of groundwater is withdrawn annually for municipal, industrial, and irrigation uses. This withdrawal probably could be doubled without causing serious depletion of storage in the groundwater reservoir or of flow in the South Fork Ninnescah River. The water generally is suitable chemically for all the common uses. However, water in deposits of Pleistocene age in a small area near Cairo is contaminated by saline water from underlying rocks of Permian age. The dissolved-solids discharge in a 7.7-mile reach of the South Fork Ninnescah River near Cairo increases from 30 to 185 tons per day. (Woodard-USGS)
W73-09453

FUNDAMENTAL PRINCIPLES IN THE STUDY OF WATER AND SALT BALANCES OF GROUNDWATER IN IRRIGATED REGIONS (OSNOVNYYE PRINTSIPY IZUCHENIYA VODNO-SOLEVOGO BALANSA GRUNTOVYKH VOD OROSHAYEMYKH TERRITORIY),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 07B.

W73-09464

THE EFFECT OF MIXING AND GRAVITATIONAL SEGREGATION BETWEEN NATURAL GAS AND INERT CUSHION GAS ON THE RECOVERY OF GAS FROM HORIZONTAL STORAGE AQUIFERS,
New Mexico Inst. of Mining and Technology, Socorro.
A. Kumar, and O. K. Kimbler.
Preprint of paper (SPE 3866) to be published in Journal of Petroleum Technology, American Institute of Mining, Metallurgical, and Petroleum Engineers, 1972. 12 p, 9 fig, 1 tab, 11 ref. OWRR A-002-LA (7) A-011-LA (3).

Descriptors: *Injection wells, *Natural gas, *Storage capacity, *Hydrofracturing, *Aquifers, Model studies, Mathematical studies, Secondary recovery (Oil), Oil reservoirs, Aquifer characteristics, Pores.
Identifiers: *Inert cushion gas, Water-gas interfaces.

The underground storage of natural gas during the summer months is widely used by the natural gas industry to supplement the increased winter demand in urban areas. Furthermore, it enables pipe lines to be operated at nearly a 100% load factor throughout the year. Gas injected from the surface under sufficient pressure will desaturate the pore space and provide storage for the gas. Ultimately, the water saturation in the gas-swept region may approach an irreducible minimum value. A calculation procedure, which considers the miscible boundary only, has been developed to calculate the gas recovery efficiency. The calculation procedure was validated by displacements in a horizontal three-dimensional radial consolidated sand model utilizing miscible liquids of differing densities. Only the natural gas-inert gas boundary is considered, which is tantamount to assuming that sufficient inert gas has been injected so that the aquifer water neither contacts nor closely approaches the mixed zone between the gases. Thus, the water-inert gas interface is considered to have no effect on the natural gas-cushion gas boundary. The percent of injected gas recovered during a particular storage cycle should increase with the number of years of operation of the storage project. (Woodard-USGS)
W73-09589

GROUND-WATER RESOURCES OF BRAZORIA COUNTY, TEXAS,
Geological Survey, Austin, Tex.
J. B. Wesselman.
Texas Water Development Board Report 163, February 1973. 199 p, 29 fig, 10 tab, 45 ref.

Descriptors: *Groundwater resources, *Water quality, *Water wells, *Aquifer characteristics, *Texas, Well data, Withdrawal, Pumping, Water yield, Drawdown, Groundwater recharge, Land subsidence, Hydrogeology, Hydrologic data, Basic data collections, Chemical analysis, Water levels, Salinity, Water utilization.
Identifiers: *Brazoria County (Tex).

The Chicot and Evangeline aquifers are the only hydrologic units bearing fresh (less than 1,000 milligrams per liter dissolved solids) or slightly saline water (1,000-3,000 mg per liter dissolved solids) in Brazoria County, Texas. These aquifers are composed of gravel, sand, silt, and clay of Pliocene, Pleistocene, and Holocene age. The average permeability of the Evangeline aquifer is about 250 gpd per square foot. The Chicot aquifer has a range of permeability from 130 to 1,655 gpd per square foot. A large cone of depression occurs in the water-level surface as a result of pumping from the upper part of the Chicot in the Brazosport area of southern Brazoria County. Land-surface subsidence of more than 1.5 feet, attributed mostly to groundwater removal, has taken place in northeast Brazoria County. Groundwater pumpage for all uses in 1967 was about 43 mgd. Of this, 22.6 mgd was used for irrigation, 12.7 for industrial use, and 7.7 mgd for public and domestic supplies. The fresh groundwater potential of the Brazosport area is fully developed or overdeveloped while in some areas in northern Brazoria County, it is relatively undeveloped. (Woodard-USGS)
W73-09590

GROUND-WATER RESOURCES OF DONLEY COUNTY, TEXAS,
Geological Survey, Austin, Tex.
B. P. Popkin.
Texas Water Development Board Report 164, February 1973. 75 p, 9 fig, 9 tab, 18 ref.

Descriptors: *Groundwater resources, *Water wells, *Water quality, *Aquifer characteristics, *Texas, Well data, Withdrawal, Pumping, Water yield, Drawdown, Groundwater recharge, Hydrogeology, Hydrologic data, Basic data collections, Water levels, Chemical analysis, Water utilization, Irrigation.
Identifiers: *Donley County (Tex).

The principal source of groundwater in Donley County, Texas, is the Ogallala Formation. The Whitehorse Group supplies small quantities of water for livestock. The allivium supplies small quantities for domestic use and irrigation. In 1967, about 38,000 acre-feet of groundwater was used in the county. Of this amount, 36,000 acre-feet was pumped for irrigation. Nearly all the water was from the Ogallala Formation. Recharge from precipitation on the outcrop of the Ogallala is estimated at 10,000 acre-feet per year. Water levels in the vicinity of Clarendon have declined as much as 20 feet since 1942 as a result of concentrated pumping for irrigation. Water in the Ogallala Formation is a very hard, calcium bicarbonate water that generally contains less than 1,000 milligrams per liter dissolved solids. About 3 million acre-feet of freshwater is in storage in the Ogallala Formation, but only half of this amount is considered to be available to wells. Water in the Whitehorse Group is a highly mineralized, calcium plus sulfate water that is suitable for livestock, supplemental irrigation, and some industrial uses. Water in the alluvium varies in quality according to the source of recharge. (Woodard-USGS)
W73-09591

APPRAISAL OF THE WATER AND RELATED LAND RESOURCES OF OKLAHOMA.
Oklahoma Water Resources Board, Oklahoma City, Region Ten.
For primary bibliographic entry see Field 04A.
W73-09599

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-09603

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE STERLING REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo.
R. T. Hurr, and P. A. Schneider, Jr.
Open-file report, 1972. 2 p, 1 fig, 6 plate, 4 ref.

Descriptors: *Groundwater resources, *Water wells, *Aquifer characteristics, *Hydrogeology, *Colorado, Valleys, Rivers, Hydrologic data, Maps, Contours, Bedrock, Water table, Saturation, Transmissivity.
Identifiers: *South Platte River Valley (Colo), Valley-fill aquifer, Stream-depletion factor.

This illustrated report of the Sterling reach of the South Platte River Valley in Colorado presents data in 6 maps, scale one mile to the inch, showing location of wells in the reach, bedrock configuration beneath the valley-fill aquifer, water-table contours of the valley-fill aquifer, saturated thickness of the aquifer, transmissivity of the aquifer, and stream-depletion factor of the aquifer. (Woodard-USGS)
W73-09605

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE BRUSH REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo.
R. T. Hurr, and P. A. Schneider, Jr.
Open-File report, 1972. 2 p, 1 fig, 6 plate, 4 ref.

Descriptors: *Groundwater resources, *Water wells, *Aquifer characteristics, *Hydrogeology, *Colorado, Valleys, Rivers, Hydrologic data, Maps, Contours, Bedrock, Water table, Saturation, Transmissivity.
Identifiers: *South Platte River Valley (Colo), Valley-fill aquifer, Stream-depletion factor.

This illustrated report of the Brush reach of South Platte River valley in Colorado presents data in 6 maps, scale one mile to the inch, showing location of wells in the reach, bedrock configuration beneath the valle-fill aquifer, water-table contours of the valley-fill aquifer, saturated thickness of the aquifer, transmissivity of the aquifer, and stream-depletion factor of the aquifer. (Woodard-USGS)
W73-09606

GEOHYDROLOGY OF SUMTER, DOOLY, PULASKI, LEE, CRISP, AND WILCOX COUNTIES, GEORGIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09619

ARIZONA AGRICULTURE - CURRENT STATUS AND OUTLOOK.
Arizona Univ., Tucson. Coll. of Agriculture.
For primary bibliographic entry see Field 03F.
W73-09686

REGULATIONS FOR PREVENTION OF POLLUTION FROM WELLS TO SUBSURFACE WATERS OF THE STATE PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.
For primary bibliographic entry see Field 06E.
W73-09694

4C. Effects on Water of Man's Non-Water Activities

ECOLOGICAL STUDIES OF THE SURFACE WATERS OF THE WHITEWATER CREEK WATERSHED, WALWORTH, ROCK AND JEFFERSON COUNTIES, WISCONSIN,
S. G. Smith.
Available from the National Technical Information Service as PB-220 351, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, 1973. 76 p, 9 tab, 8 fig, 12 ref, append. OWRR A-021-WIS (1) 14-01-0001-1870.

Descriptors: *Nutrients, *Water temperature, *Electrical conductance, Freshwater fish, Fish types, *Ecotypes, *Vegetation, *Aquatic animals, *Aquatic life, *Aquatic plants, *Agricultural watersheds, Sodium chloride, *Waste water

disposal, *Sewage effluent, Industrial wastes, *Wisconsin, Ecology, *Ecosystems, *Biota.
Identifiers: *Whitewater Creek (Wisc).

The Whitewater study area includes a wide variety of natural and cultural features to demonstrate the interaction of land use practices on an environment. The artesian springs drain into feeder streams that flow through two lake impoundments that eventually discharge into a mature stream system. Although urban runoff from the streets of the City of Whitewater, sewage treatment plant effluent, industrial waste spills, and agricultural activities in the areas have a significant effect on the native ecology, high quality ecological conditions are maintained in the underdeveloped headwater area. Assessment of the ecology in the watershed is supported by one year of monitoring of the temperature and conductivity of the water and periodic water chemistry analyses at selected sites in the area. Complimentary studies of the biota were conducted on vascular plants, fish and invertebrate animals. Listings of the water chemistry and identification of the biota species are provided. (Kerrigan-Wisconsin)
W73-09117

EFFECT OF TALL VEGETATIONS ON FLOW AND SEDIMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R.-M. Li, and H. W. Shen.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 99, No HY5, Paper 9748, p 793-814, May 1973. 13 fig, 3 tab, 13 ref, append. OWRR Grant 14-01-0001-1435.

Descriptors: *Erosion, *Erosion control, *Vegetation effects, *Mathematical models, *Clear-cutting, Flow resistance, Streamflow, Hydraulics, Watershed management, Shear stress, Roughness (Hydraulic), Deposition (Sediments), Sediment yield, Sedimentation.

A mathematical model estimates the resistance of flow due to various groupings of tall vegetations (such as trees on flood plains). The relative effect of various groupings of tall vegetation on the reduction of sediment yields is based on reduction of flow rates. This should be useful in determining the effects of clear cutting and other selective cutting of forest lumber. Tall vegetation grouped into staggered patterns is much more effective in reducing flow rate than other patterns. Because it is difficult to harvest tall vegetation to make a staggered pattern, the next best thing is to harvest tall vegetation in rows that are perpendicular to flow direction. The average boundary shear stress on the bed is much more sensitive to change of bottom slope and to the size of vegetation than to variations of flow discharge and sediment size. The boundary shear stress will increase significantly as trees grow larger. (Knapp-USGS)
W73-09274

RUNOFF AND SOIL LOSSES ON HAGERSTOWN SILTY CLAY LOAM: EFFECT OF HERBICIDE TREATMENT,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 02J.
W73-09279

EFFECTS OF LOGGING AND LOGGING ROADS ON EROSION AND SEDIMENT DEPOSITION FROM STEEP TERRAIN,
Forest Service (USDA), Boise, Idaho. Intermountain Forest and Range Experiment Station.
W. F. Megahan, and W. J. Kidd.
J. Forestry 70 (3): 136-141, March 1972.

Descriptors: *Erosion, *Sediments, *Road construction, *Forest management, *Timber, Sediment control, Sediment yield, Erosion control, Slope stability, Vegetation establishment, Storms, Roadbanks, Soil stabilization, Sedimentation rates, Watershed management.
Identifiers: Logging (Forest).

Erosion plots and sediment dams were used to evaluate the effects of jammer and skyline logging systems on erosion and sedimentation in steep, ephemeral drainages in the Idaho Batholith of central Idaho. Plot data collected periodically over a 5-year period indicated that no difference in erosion resulted from the two skidding systems as applied in the study. Concurrent sediment dam data were used to show that the logging operations alone (excluding roads) increased sediment production only about 0.6 times over the natural sedimentation rate. Roads associated with the jammer logging system increased sediment production an average of about 750 times over the natural rate for the 6-year period following construction.
W73-09374

CHANGES IN THE FOREST FLOOR UNDER UPLAND OAK STANDS AND MANAGED LOBLOLLY PINE PLANTATIONS,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
B. P. Dickerson.
J. For. 70 (9): 560-562, Sept 1972, Illus.

Descriptors: *Loblolly pine trees, *Clearcutting, *Erosion control, *Soil stabilization, Forest management, Soil erosion, Surface runoff, Forest soils, Mississippi.
Identifiers: *Litter, *Litterfall, *Forest floor, Thinning.

Three years after all standing timber in a loblolly pine (Pinus taeda L.) plantation in northern Mississippi was removed, the forest floor there averaged 3 tons per acre less than under uncut stands. Reducing pine basal area from 130 to 75 square feet per acre caused a 1-1/2-ton-per-acre decline in forest floor weight and an 18-percent decline in annual litterfall. The forest floor under deadened low-grade oak stands deteriorated rapidly and would have been completely gone in six years had not other vegetation invaded the area.
W73-09376

GROWTH AND HYDROLOGIC INFLUENCE OF EUROPEAN LARCH AND RED PINE 10 YEARS AFTER PLANTING,
Forest Service, (USDA), La Crosse, Wis. Watershed Lab.
R. S. Sartz, and A. R. Harris.
USDA Forest Serv. Res. Note NC-144, 1972. 4 p.

Descriptors: *Flood protection, *Water conservation, *Land management, *Vegetation establishment, Soil properties, Forest management, Land use, Infiltration.
Identifiers: *Litter, *Soil water storage, Soil bulk density.

Ten years after planting, European larch and red pine diameters averaged 11.2 and 9.6 cm., and heights averaged 9.7 and 5.1 m. Litter on the larch plots was twice as heavy as on the pine and unplanted control plots. Organic carbon content of the top 5 cm. of soil appeared to reflect vegetation differences, but soil bulk density did not. The amount of water depleted by the two species was about the same, and it was about twice the amount depleted by a grass and weed cover.
W73-09377

WATER-RESOURCE EFFECTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-09432

QUALITY OF STREAM WATERS OF THE WHITE CLOUD PEAKS AREA, IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-09435

CLEAR-CUTTING AND ITS EFFECT ON THE WATER TEMPERATURE OF A SMALL STREAM IN NORTHERN VIRGINIA,
Geological Survey, Arlington, Va.
E. J. Pluhowski.
Available from Sup Doc, GPO, Washington D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C257-C262, 1972. 5 fig, 1 tab, 8 ref.

Descriptors: *Clear-cutting, *Water temperature, *Virginia, *Urbanization, *Urban hydrology, Storm runoff, Vegetation effects, Solar radiation.
Identifiers: Reston (Va).

Tree and shrub removal from a reach of 1,100 feet at the lower end of Colvin Run near Reston, Va., has altered stream-temperature patterns. Because increased solar radiation, especially in summer, maximum water temperature at the lower end of the reach is frequently 1 deg to 3.5 deg C higher than that observed at the upper end. An energy budget, prepared for the period 1415-1500 hours, July 15, 1969, quantifies the principal energy sources controlling stream temperature in the reach. (Knapp-USGS)
W73-09444

FLOODFLOW CHARACTERISTICS OF EAST FORK HORSEHEAD CREEK AT INTERSTATE HIGHWAY 40, NEAR HARTMAN, ARKANSAS,
Geological Survey, Little Rock, Ark.
J. L. Patterson, and J. N. Sullavan.
Open-file report, November 1972. 8 p, 3 fig.

Descriptors: *Floods, *Backwater, *Obstruction to flow, *Arkansas, Routing, Highway effects, Bridges, Abutments, Streamflow, Flow profiles.

The Arkansas State Highway Department requested a study of the East Fork of Horsehead Creek bridge site on Interstate Highway 40, approximately 5 miles west of the junction of U.S. Highway 64 and I-40 at Clarksville, Ark. This report includes a study of the magnitude and duration of the December 10, 1971, flood and the amount of backwater caused by the highway bridge and embankment. The flood of Dec. 10, 1971 which was slightly smaller than the 50-year flood, and has a recurrence interval of about 40 years, was used in the hydraulic analysis. By using routing procedures, it was determined that the elevation in the vicinity of the buildings, 600 feet upstream from the bridge, would have been about 424.6 feet before the highway was built as compared with 426.2 feet with the highway in place. The water elevation would be above 423 feet for about 2 hours without backwater and about 3 hours under present conditions. (Knapp-USGS)
W73-09608

4D. Watershed Protection

HYDROLOGY AND EFFECTS OF CONSERVATION STRUCTURES, WILLOW CREEK BASIN, VALLEY COUNTY, MONTANA, 1954-68,
Geological Survey Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-09167

EFFECT OF TALL VEGETATIONS ON FLOW AND SEDIMENT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04C.
W73-09274

VOLUME WEIGHT OF RESERVOIR SEDIMENT IN FORESTED AREAS,
Forest Service (USDA), Boise, Idaho. Intermountain Forest and Range Experiment Station.
W. F. Megahan.
Journal of the Hydraulics Division, ASCE, Vol 98, No HY8, Proc Paper 9129, August 1972, p 1335-1342.

Descriptors: *Sedimentation, *Reservoir silting, *Organic matter, *Mountain forests, Reservoir storage, Particle size, Watersheds (Basins), Bulk density, Idaho.
Identifiers: *Experiment watersheds, *Idaho batholith, *Volume weight, Undisturbed forest.

Volume weight samples of deposited sediments were collected from small sediment retention dams in up to twelve forested watersheds in Idaho during 1969 and 1970. Volume weights varied considerably among the various watersheds and within a given impoundment. The percentage of organic matter by weight in the samples provided a reliable estimate of sediment volume weight--better than the more conventional approach of relating volume weight to sediment particle size. The organic matter content of sediments may represent a substantial volume of storage loss for reservoirs on forested or range watersheds. In addition, organic sediments may have important ecological implications.
W73-09373

SOIL WATER DISTRIBUTION ON A CONTOUR-TRENCHED AREA,
Forest Service (USDA), Logan, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02G.
W73-09375

CHANGES IN THE FOREST FLOOR UNDER UPLAND OAK STANDS AND MANAGED LOBLOLLY PINE PLANTATIONS,
Forest Service (USDA), Oxford, Miss. Southern Forest Experiment Station.
For primary bibliographic entry see Field 04C.
W73-09376

DESCRIPTION AND HYDROLOGIC ANALYSIS OF TWO SMALL WATERSHEDS IN UTAH'S WASATCH MOUNTAINS,
Forest Service, (USDA), Logan, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02A.
W73-09378

THE RELATION OF FORESTS AND FORESTRY TO WATER RESOURCES,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 04A.
W73-09537

FACTORS INFLUENCING INFILTRATION AND EROSION ON CHAINED PINYON-JUNIPER SITES IN UTAH,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 02G.
W73-09684

CORNUDAS, NORTH AND CULP DRAWS WATERSHED, HUDSPETH COUNTY, TEXAS AND OTERO COUNTY, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-09699

WATERSHED FIELD INSPECTIONS--1971.
For primary bibliographic entry see Field 06E.
W73-09704

ALABAMA WATERSHED MANAGEMENT ACT.
For primary bibliographic entry see Field 06E.
W73-09748

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

WATER QUALITY AS RELATED TO POSSIBLE HEAVY METAL ADDITIONS IN SURFACE AND GROUNDWATER IN THE SPRINGFIELD AND JOPLIN AREAS, MISSOURI,
Missouri Water Resources Research Center, Rolla.
P. Proctor, G. Kisvarsanyi, E. Garrison, and A. Williams.
Available from the National Technical Information Service as PB-220 245, $3.00 in paper copy, $0.95 in microfiche. Completion Report, April 1973. 56 p, 18 fig, 2 tab, 22 ref, append. OWRR B-054-MO (1) 14-31-0001-3606.

Descriptors: Water quality, *Heavy metals, Cadmium, Mercury, Copper, *Lead, *Zinc, Iron, Surface waters, Groundwater, Springs, Mining, Trace elements, Distribution patterns, *Missouri, Potable water, Water quality standards, Water wells, *Water analysis.
Identifiers: Source rocks, Joplin (Mo), Springfield (Mo).

Some 165 seasonal water samples were collected and analyzed for heavy metals from surface and subsurface sources in a one hundred mile area around Springfield and Joplin, Missouri, respectively. Joplin is in a former large zinc mining district. Springfield is 72 miles east. Locally, cadmium, lead, zinc and iron exceed acceptable PHS standards for drinking water, but the majority of water samples are well within the established limits. Yet, ten percent of the water wells sampled in the Springfield area and twenty-five percent of those sampled in the Joplin area approached or exceeded the PHS limits of the one or more heavy metals for drinking water. High zinc values are related to known zinc-lead mineralization in both areas. Average cadmium values are slightly higher in Joplin, copper content is similar for both areas, and lead content is slightly higher near Joplin. Surface waters in Joplin are 17 times higher in average zinc content than in Springfield, though shallow wells for both areas are similar in zinc content. Iron is higher and more variable in Joplin. Mercury, in very low quantity in both areas, is somewhat higher in the Springfield area. Some seasonal variation occurs in the heavy metal content in both areas. Alternate sources of water are suggested for those areas having heavy metal content in excess of PHS standards. Effects on living systems within areas containing anomalous heavy metal content are unknown.
W73-09104

IRON IN SURFACE AND SUBSURFACE WATERS, GRIZZLEY BAR, SOUTHEASTERN ALASKA,
Alaska Univ., College. Dept. of Geology.
C. M.Hoskins, and R. M. Slatt.
Available from the National Technical Information Service as PB-220 248, $3.00 in paper copy, $0.95 in microfiche. Alaska Institute of Water Resources, Fairbanks, Publication No IWR-29, August 1972, 15 p, 3 fig, 1 tab, 39 ref. OWRR A-019-ALAS (3), and 026-ALAS (4).

Descriptors: *Iron, *Alaska, *Spectrophotometry, Melt water, Pollutant identification, *Glacial drift, Iron compounds.
Identifiers: *Atomic absorption spectrophotometry, Norris Glacier (Alas), Iron precipitates.

Atomic absorption spectrophotometric measurements for total iron were made on 69 samples of water from 8 different environments in an outwash fan built by meltwater streams from the retreating Norris Glacier on granodiorite bedrock. Norris Glacier ice contained no iron (3 samples), a subglacial stream contained 5.5 ppm Fe (1 sample), and a meltwater lake fronting Norris Glacier contained 0.7 ppm Fe (3 samples). Iron content of groundwater from outwash ranged between 0.0 and 17.0 ppm (6 samples; surface streams fed by emergent groundwater on the fan periphery contained 0.0 to 0.2 ppm Fe (13 samples). Taku Inlet waters contained 6.4 ppm Fe (3 samples). Subsurface water from an intertidal mud flat contained between 0.0 and 27.0 X 5.9 ppm Fe (31 samples). Surface and subsurface water from a bog and associated stream contained 1 ppm Fe (12 samples). Little exchangeable Fe was found. In situ measurement in water for Eh showed large positive values (+0.30 to +0.50 volts) and pH was slightly alkaline. The single most important source of iron was vermiculitized biotite. Iron was transported in water in the particulate state, except in outwash groundwater where particulate Fe+3 was reduced to dissolved Fe+2. Iron deposits of Fe (OH)3 were found near the top of the outwash water table.
W73-09111

ECOLOGICAL STUDIES OF THE SURFACE WATERS OF THE WHITEWATER CREEK WATERSHED, WALWORTH, ROCK AND JEFFERSON COUNTIES, WISCONSIN,
For primary bibliographic entry see Field 04C.
W73-09117

PROCESSING FOR SPACEBORNE SYNTHETIC APERTURE RADAR IMAGERY,
Computer Sciences Corp., Huntsville, Ala.
For primary bibliographic entry see Field 07B.
W73-09124

CHEMICAL QUALITY OF SURFACE WATER IN THE FLAMING GORGE RESERVOIR AREA, WYOMING AND UTAH,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-09127

CONCENTRATIONS OF BIOGENIC ELEMENTS IN THE MOZHAYSK RESERVOIR (ZAPASY BIOGENNYKH ELEMENTOV V MOZHAYSKOM VODOKHRANILISHCHE),
Moscow State Univ. (USSR). Chair of Hydrology.
For primary bibliographic entry see Field 02H.
W73-09151

RECOMMENDED METHODS FOR WATER DATA ACQUISITION.
For primary bibliographic entry see Field 07A.
W73-09161

PROFILES OF CHLOROPHYLL CONCENTRATIONS BY IN VIVO FLUORESCENCE: SOME LIMNOLOGICAL APPLICATIONS,
Kinneret Limnological Lab., Tiberias (Israel).
For primary bibliographic entry see Field 05C.
W73-09200

MICROBIOLOGICAL SEA WATER CONTAMINATION ALONG THE BELGIAN COAST, II - TECHNIQUES - NORMS - PRELIMINARY RESULTS,
Belgian Army Military Hospital, Ostend. Lab. for Sea Microbiology.
For primary bibliographic entry see Field 05B.
W73-09204

MECHANISM OF RESPIRATORY EXCHANGES IN AQUATIC ENVIRONMENT. A GENERAL REVIEW INCLUDING PERSONAL RESULTS,
Amiens Univ. (France). Laboratoire de Physiologie.
For primary bibliographic entry see Field 05C.
W73-09206

RESEARCH OF THE ORGANOCHLORINE PESTICIDES IN THE LITTORAL ENVIRONMENT (RECHERCHE DES PESTICIDES ORGANOCHLORES DANS LES MILIEUX LITTORAUX),
For primary bibliographic entry see Field 05C.
W73-09209

PERSPECTIVES OF USE OF LUMINESCENT METHODS FOR RESEARCH OF THE POLLUTION PROCESS IN THE SEA (PERSPEKTIVEN DER ANWENDUNG VON LUMINESZENS--METHODEN ZUR UNTERSUCHUNG DER AUSBREITUNGS-PROZESSE VON BEIMENGUNG IM MEER),
G. S. Karabashev.
Beitrage zur Meereskunde, No 30-31, p 93-99, 1972. 2 fig, 1 tab, 8 ref.

Descriptors: Water pollution sources, Pollutant identification, *Indicators, *Diffusion, *Tracers, Light, Color, Radioisotopes, Absorption, Photography, *Path of pollutants.
Identifiers: *Luminescent substances, *Baltic Sea.

The use of luminescent substances as pollution indicators is considered. These luminescent substances were compared to colored substances and radioisotopes. With luminescent substances it is possible to determine the concentration of pollutants from luminous strength and absorption, visual and photographic methods. The vertical intensity distribution of photoluminescence in the Baltic Sea is also presented. (Ensign-PAI)
W73-09211

STUDIES OF MIXING AND THINNING PROCESSES OF POLLUTION IN SEWAGE DISCHARGE AREAS IN THE SEA THROUGH THE USE OF FLUORESCENT INDICATORS (UNTERSUCHUNG DER VERMISCHUNGS- UND VERDUNNUNGSPROZESSE VON VERUNREINIGUNGEN IN ABWA SSEREINLEITUNGSGEBIETEN IM MEER MIT HILFE FLUORESZIERENDER INDIKATOREN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05B.
W73-09212

A TRACER SIMULATION OF WASTE TRANSPORT IN THE MUDDY CREEK-RHODE RIVER ESTUARY, MARYLAND,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 05B.
W73-09217

BIOLOGICAL ANALYSIS OF WATER AND WASTEWATER.
Millipore Corp., Bedford, Mass.

Application Manual AM302, March, 1972, 80 p.

Descriptors: Water quality, *Water sampling, Laboratory equipment, Laboratory tests, *E. coli, Streptococcus, Pathogenic bacteria, *Enteric bacteria, Water analysis.
Identifiers: Field testing, *Fecal coliforms, *Biological analysis.

A collection of available technologey for the microbiological analysis of water and wastewater is given. The latest techniques taught at the National Training Center, FWQA, Cincinnati, Ohio, are incorporated and applied. An introduction to the importance of sampling, a basic equipment list for reference use, description of preparations and uses for specific pieces of equipment, plus detailed accounts of sampling techniques are given in the section on Sampling. The section on Lab Preparation lists photo illustrated descriptions of equipment used, plus various laboratory media and reagents needed to perform the three basic indicator organism tests. Other sections deal with Laboratory testing (including fecal coliform, fecal strep, and FC/FS ratio), Field Testing, Analysis of Swimming Pool Waters, General Discussions (indicator organisms) and Appendices (Detection of Enteric pathogens, monitoring of non-sanitary microorganisms). (Campbell-NWWA)
W73-09254

INSTRUMENTATION FOR ENVIRONMENTAL MONITORING: WATER.
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 07B.
W73-09268

WATER RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1973.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W73-09278

HYDRAULIC EQUIVALENT SEDIMENT ANALYZER (HESA),
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 07B.
W73-09282

PROGRESS REPORT ON WATER-RESOURCES INVESTIGATIONS IN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-09284

THE FRACTIONATION OF HUMIC ACIDS FROM NATURAL WATER SYSTEMS,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02K.
W73-09295

FLUORITE EQUILIBRIA IN THERMAL SPRINGS OF THE SNAKE RIVER BASIN, IDAHO,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W73-09296

DETERMINATION OF RESIDUES FROM HERBICIDE N- (1,1-DIMETHYLPROPYNYL)-3, 5--DICHLOROBENZAMIDE BY ELECTRON CAPTURE GAS-LIQUID CHROMATOGRAPHY.
Rohm and Haas Co., Bristol, Pa. Bristol Research Labs.
I. L. Adler, C. F. Gordon, L. D. Haines, and J. P. Wargo, Jr.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 802-805, July 1972. 2 fig, 4 tab, 4 ref.

Descriptors: *Pesticide residues, Urine, Separation techniques, Herbicides, Gas chromatography, Pollutant identification, Water pollution sources, Alfalfa, Lettuce, Tomatoes, Legumes, Soils, Milk, Solvent extractions, Radiochemical analysis, Chlorinated hydrocarbon pesticides, Organic pesticides, Halogenated pesticides, Digestion, Soil analysis, Sugar beets.
Identifiers: N- (1 1-dimethylpropynyl)-3 5-dichlorobenzene, *Gas liquid chromatography, Sample preparation, *Biological samples, *Electron capture gas chromatography, Liver, Kidneys, Muscle, Fat, Metabolites, Egg white, Egg yolk, Feces, Petroleum ether, Benzene, Hexane, Methanol, Florisil, C-14, Chemical recovery, Detection limits, Co-distillation, Method validation.

Terminal residues of n- (1,1-dimethylpropynyl)-3,5-dichlorobenzamide and its metabolites were determined by an electron capture gas chromatographic analysis of various biological samples which had been predigested with sulfuric acid and methanol to convert the residues to methyl 3,5-dichlorobenzoate (MDCB). In preparing the digested biological samples (including alfalfa, eggs, fat, feces, liver, kidney, muscle, lettuce, tomatoes, milk, soil, beets, urine) for chromatographic analysis, the MDCB was first codistilled from the reaction mixture and purified by chromatography on Florisil. This GLC analytical procedure proved sensitive to residues of 0.01 ppm. The procedure was validated by recovering labelled C-14 MDCB which had been added to samples prior to the digestion step; recoveries were determined by measuring the peak due to MDCB on the gas chromatogram as well as the radioassay of the final eluant. (Long-Battelle)
W73-09300

DETECTION OF HEXACHLOROBENZENE RESIDUES IN DAIRY PRODUCTS, MEAT FAT, AND EGGS,
Australian Customs Lab., Seaton.
R. J. Smyth.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 806-808, July 1972. 3 tab, 6 ref.

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Pollutant identification, *Gas chromatography, Heptachlor, DDE, Dieldrin, DDD, DDT, Aldrin, Endrin, Separation techniques, Organic pesticides, Dairy products, Fungicides, Wheat, Chemical analysis.
Identifiers: *Biological samples, Thin layer chromatography, Detection limits, Sample preparation, Hexachlorobenzene, Florisil, Hexane, Alpha-benzene hexachloride, Fat, Eggs, Lindane, Heptachlor epoxide, Butter, Cheese, Chemical recovery, Cleanup.

A gas chromatographic procedure, using deactivated Florisil for cleanup of fatty acids, is employed for the detection of hexachlorobenzene residues extracted with hexane from dairy products, meat fat, and eggs. The extracted residues, including alpha-benzene hexachloride, hexachlorobenzene, lindane, heptachlor, aldrin, heptachlor epoxide, DDE, dieldrin, endrin, DDD, and DDT, were eluted from the column containing a mixture of DC-200 and QF-1. The retention times for these pesticides are tabulated in reference to the retention time of aldrin. The pesticides detected by this method were confirmed by thin-layer chromatography; the lower detection limit of the pesticides examined was about 0.002 ppm based on a 1 g sample of fat. (Long-Battelle)
W73-09301

ORTHOPHOSPHATE DETERMINATIONS USING PREMEASURED REAGENTS,
Missouri Univ., Columbia. Dept. of Microbiology.
R. C. Baskett.
Water and Sewage Works, Vol 120, No 1, p 47, January 1973. 1 tab, 2 ref.

Descriptors: *Spectrophotometry, *Water analysis, Colorimetry, Phosphates.
Identifiers: Accuracy, *Orthophosphates, Reagents.

A simple and convenient method for determining orthophosphate in water involves using a spectrophotometer, premeasured powder pillows of reagent (Murphy and Riley formula), and 5 ml water

samples. The spectrophotometer is operated at a wavelength setting of 710 millimicrons. The percent transmittance can be converted to mg/l phosphate by means of a standard curve. The test has proved to be rapid and well within the established limits of accuracy for conventional orthophosphate measurements. (Little-Battelle)
W73-09305

HYDROGEN PEROXIDE AIDS IN MEASURING SLUDGE OXYGEN UPTAKE RATES,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-09308

FLUORESCAMINE: A REAGENT FOR ASSAY OF AMINO ACIDS, PEPTIDES, PROTEINS, AND PRIMARY AMINES IN THE PICOMOLE RANGE,
Roche Inst. of Molecular Biology, Nutley, N.J.
S. Udenfriend, S. Stein, P. Bohlen, W. Dairman, and W. Leimgruber.
Science, Vol 178, No 4063, p 871-872. November 24, 1972. 3 fig, 1 tab, 15 ref.

Descriptors: *Amino acids, *Proteins, *Peptides, *Assay, *Aqueous solutions, Fluorescence, Pollutant identification, Hydrogen ion concentration, Organic acids.
Identifiers: *Primary amines, *Fluorescamine, Reagents, Organic solvents, Thin layer chromatography, Gamma-aminobutyric acid, Beta-alanine, Histamine, Catecholamines, Amphetamine, Spermine, Amino sugars, Spermidine.

Fluorescamine is a new reagent for the detection of primary amines in the picomole range. Its reaction with amines is almost instantaneous at room temperature in aqueous media. The products are highly fluorescent, whereas the reagent and its degradation products are nonfluorescent. An important application has been the assay of proteins during protein purification procedures. Assays carried out manually can be used to determine 0.5 microgram of protein. With a semi-automated procedure (similar to the one for amino acid assay) and a Bio-Gel column to separate nonprotein material, as little as 0.05 microgram of protein can be assayed. Fluorescamine can be used as an amine reagent not only in aqueous solution but also in organic solvents and on solids. It has been used as a spray to detect amino acids and peptides on thin layer chromatograms. As little as 20 pmole of each can be detected. Fluorescamine yields intense fluorescence with other primary amines of biological importance. Thus, gamma-aminobutyric acid, beta-alanine, histamine, catecholamines, amphetamine, amino sugars, spermine, and spermidine also yield the characteristic fluorophore. Procedures for extracting and assaying the two polyamines in milligram quantities of tissue have been found feasible. (Holoman-Battelle)
W73-09310

ANALYTICAL METHOD FOR DETERMINATION OF INORGANIC NITRATES IN NATURAL STREAM WATER,
Naval Ordnance Lab., White Oak, Md.
D. Sam.
Report No NOLTR 72-295, December 26, 1972. 10 p, 2 fig, 2 tab, 1 ref. Contract No ORD332005-201-23.

Descriptors: *Nitrites, Methodology, *Water analysis, *Natural streams, *Pollutant identification, Chemical analysis, Spectrophotometry, Anion exchange, Reliability.
Identifiers: Diazotization, Azo dyes, Ion exchange resins, Detection limits, Sample preparation, Absorbance, Sensitivity, Preconcentration.

A sensitive and reliable procedure has been developed which is applicable for determination of inorganic nitrites in natural stream water in concentrations as low as 0.1 micromoles/liter. Samples are concentrated by an ion exchange procedure prior to the spectrophotometric measurement of the nitrite in the form of an azo dye. The spectrophotometric measurement of the azo dye is found to conform to Beer's law. The nitrite sample is treated with sulfanilic acid and N- (1-Naphthyl)-ethylenediamine dihydrochloride to form a red azo dye. The dye is passed through a column of Dowex 1-x8, 50-100 mesh, anion exchange resin and then it is eluted with 60 percent acetic acid. The resulting effluent is measured in a Cary 16 spectrophotometer at 550 nm in a cell of 10 cm optical path. The application of this method to the determination of natural stream water is discussed. (Holoman-Battelle)
W73-09311

THALASSIOSIRA ECCENTRICA (EHRENB.) CLEVE, T. SYMMETRICA SP. NOV., AND SOME RELATED CENTRIC DIATOMS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-09312

DISSOLVED FREE AMINO ACIDS IN SOUTHERN CALIFORNIA COASTAL WATERS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.
For primary bibliographic entry see Field 05B.
W73-09324

PREPARATION OF MEMBRANE FILTER SAMPLES FOR DIRECT EXAMINATION WITH AN ELECTRON MICROSCOPE,
Texas A and M Univ., College Station. School of Geosciences.
J. E. Harris, T. R. McKee, and R. C. Wilson, Jr.
Limnology and Oceanography, Vol 17, No 5, p 784-787, September 1972. 3 fig, 7 ref.

Descriptors: *Electron microscopy, *Laboratory equipment, Distribution patterns, Aquatic microorganisms, Clay minerals.
Identifiers: *Membrane filters, *Sample preparation, Cellulose membranes, Particulate matter.

A simple apparatus is described for transferring samples of suspended matter collected on Millipore filters to specimen grids for examination with an electron microscope. The apparatus is made from glassware available in most laboratories and is relatively inexpensive. Samples of suspended matter prepared with this method have been used to obtain the particle size distribution and shapes for particles between 5 and 0.05 microns. The distribution of coccoliths and other nanoorganism remains in the water column of the Gulf of Mexico are being studied. Clay minerals have been studied and successfully identified using selected area electron diffraction on samples prepared with this apparatus. This method should also be useful in preparing samples for light microscopy. (Holoman-Battelle)
W73-09326

FRESHWATER HARPACTICOID COPEPODS OF NEW ZEALAND, I. ATTHEYELLA ELAPHOIDELLA (CANTHOCAMPTIDAE),
Auckland Univ. (New Zealand). Dept. of Zoology.
M. H.Lewis.
New Zealand Journal of Marine and Freshwater Research, Vol 6, Nos 1 and 2, June 1972. 14 fig, 14 ref.

Descriptors: *Copepods, *Crustaceans, *Aquatic animals, *Systematics, Invertebrates, Ecological distribution, Habitats, Mosses, Peat.
Identifiers: *Harpacticoids, *Speciation, Attheyella (Delachauxiella) spp., Canthocamptus spp., Atthyella (Chappuisiella) spp., Elaphoidella spp., *New Zealand, Delachauxiella spp., Arthropods, Macroinvertebrates, Sample preservation.

Seven species of Attheyella and two of Elaphoidella are discussed. The original descriptions of A. brehmi (Chappuis, 1929) and A. maorica (Brehm, 1928) are revised and five new species described: two from each of the subgenera Delachauxiella and Chappusiella and a semi-terrestrial species of Elaphoidella. (Holoman-Battelle)
W73-09327

UNDERWATER CAMERA SYSTEM FOR DEEP--SEA BOTTOM PHOTOGRAPHY,
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
R. J. Singleton, and A. G. Cole.
New Zealand Journal of Marine and Freshwater Research, Vol 6, Nos 1 and 2, p 185-193, June 1972. 6 fig, 6 ref.

Descriptors: *Deep water, *Photography, *Sea water, Mechanical equipment, On-site data collections, On-site investigations, Construction, Design data, Marine environment.
Identifiers: *Underwater camera system, *Sea bottom, Underwater cameras.

A 35 mm camera system has been developed to operate to depth of 4,000 m. The camera and trigger unit are in an underwater housing and are worked by a magnetic switch which is closed on contact with the ocean bottoms. The camera in turn fires a flash unit in a separate housing. A DC/DC converter charges the flash unit from batteries and a Schmitt trigger turns off the DC/DC converter when the flash unit is charged, thus extending battery life. The system described uses standard carbon-zinc torch cells, and has been designed to give maximum battery life by using a flash unit of relatively low output (40 J), restricting the recycle time of the system to 60 s, and an electronic system to turn off the power to the flash unit when fully charged. The batteries in the flash unit will last 300 flashes or more, and those of the camera unit more than 1,000. The system takes up to 24 pictures at one lowering. Details of the system are given. (Holoman-Battelle)
W73-09329

DEVICE FOR DETECTING AND MEASURING ACTIVITY OF LARGE MARINE CRUSTACEANS,
Marine Dept., Wellington, (New Zealand). Fisheries Research Div.
For primary bibliographic entry see Field 07B.
W73-09330

STANDARDS FOR FAECAL COLIFORM BACTERIAL POLLUTION,
Otago Univ., Dunedin (New Zealand). Dept of Microbiology.
M. Loutit.
New Zealand Journal of Marine and Freshwater Research, Vol 6, Nos 1 and 2, p214-219, June 1972. 1 tab, 6 ref.

Descriptors: *Bioindicators, Water pollution, *Water quality standards, *Coliforms, Water pollution sources, E. coli.
Identifiers: *Fecal coliforms, Enumeration, Presumptive test, New Zealand, Klebsiella rhinoscleromatus, Lactose broth, MacConkey broth, Culture media, Selective media, Citrobacter freundii, Klebsiella ozaenae, Klebsiella aerogenes, Klebsiella pneumoniae.

Vidal and Collins (1970) discussed the applicability of a national standard for fecal coliform bacteria in the Wellington, New Zealand area. Comments have been made concerning the author's (1) use of

the presumptive coliform test, (2) method (s) of counting fecal and non-fecal coliforms, and (3) contention that less strict standards be employed for the Wellington area. In response to the comments, the authors (Vidal and Collins) make clear the following points: (1) The production of gas and acid in MacConkey broth confirms rather than presumes the presence of coliform bacteria for water examination purposes. (2) The generally accepted term 'fecal coliforms' better suits the modern concept of an indicator of fecal pollution. (3) The term 'non-fecal' is unacceptable because all known coliforms can occur in faeces, although they do not invariably do so. (4) The lactose broth used in experimentation showed no selectivity between fecal coliforms and other coliform bacteria. (5) If a standard of 200 fecal coliforms/100 ml were set, then the Wellington area would not be on equal basis with districts where fecal coliforms make up a small proportion of the total index of coliform bacteria. (Holoman-Battelle)
W73-09331

RECOVERY OF SHIGELLA UNDER ACIDIC CONDITIONS,
Food and Drug Administration, Washington, D.C. Div. of Microbiology.
M. Fishbein, I. Mehlman, and B. Wentz.
Journal of the Association of Official Analytical Chemists, Vol 55, No 6, p 1323-1327, November 1972. 5 tab, 7 ref.

Descriptors: *Shigella, *Acidity, *Hydrogen ion concentration, *Aerobic bacteria, *Enteric bacteria, Competition, Organic acids, Pathogenic bacteria, Coliforms, Inhibition, Growth rates, E. coli.
Identifiers: Recovery, Culture media, Substrate utilization, Enrichment, Inorganic acids, Enterobacteriaceae, Shigella dysenteriae, Shigella flexneri, Shigella boydii, Shigella sonnei, Enterobacter aerogenes, Enterobacter cloacae, Enterobacter freundii, Serratia marcescens, Proteus rettgeri, Proteus stuartii, Salmonella typhimurium, Formic acid, Acetic acid, Sulfur acid, Lactic acid, Trypticase soy broth, Veal infusion broth, BHI broth, GN broth.

The rationale for an investigative approach in the recovery of small numbers of Shigella in the presence of large numbers of the competitive Enterobacteriaceae was discussed. On this basis, the acid production of the Enterobacteriaceae in common enrichment media was explored. The inhibition of Shigella growth initiation from small inocula (10-50 organisms/ml) by particular acid metabolites, such as formic and acetic acids, was shown. Finally, the ability of small Shigella inocula to grow in the fermented acidic media in which the Enterobacteriaceae have previously grown was studied in detail. It is recommended that the competitive factors affecting Shigella be studied further. (Holoman-Battelle)
W73-09332

GAMMA SPECTROSCOPIC DETERMINATION OF CESIUM-137 IN MILK, USING SIMULTANEOUS EQUATIONS: COLLABORATIVE STUDY,
Environmental Protection Agency, Winchester, Mass. Quality Control Service.
E. J. Baratta, and F. E. Knowles, Jr.
Journal of the Association of Official Analytical Chemists, Vol 56, No 1, p 204-207, January 1973. 1 fig, 1 tab, 9 ref.

Descriptors: *Milk, *Pollutant identification, Iodine radioisotopes, Radioactivity, Methodology, Statistical methods, Aqueous solutions.
Identifiers: *Collaborative studies, *Cs-137, *Interlaboratory studies, Precision, Method evaluation, Cesium radioisotopes, Chemical interference, I-131, Ba-140, Barium radioisotopes, Recovery, Errors.

A gamma spectroscopic method, using a sodium iodide (thallium-activated) crystal, was evaluated by 25 collaborators for the determination of cesium-137 in milk. Triplicate analyses were performed on 2 milk samples with high and low activities. The values obtained were statistically analyzed by the use of laboratory mean values. The statistical analysis showed that the collaborators were able to determine levels of activity in the two samples satisfactorily. There was a greater dispersion of results for the low level sample which was not surprising and was to be expected. The percent error found for the low level of Cs-137 activity was 10.2 and that for the high level was 5.9. Overall average recoveries of 295 plus or minus 18.1 and 53 plus or minus 5.3 pCi/L were obtained for samples containing 305 and 52 pCi/L, respectively. The presence of iodine-131 and barium-140 did not interfere with the analyses. This method has been recommended to be adopted as official first action since: (1) the slight bias on the low side and the greater dispersion of results for the low level sample were not considered serious; and (2) the method is acceptable for the analysis of various levels of Cs-137 activity in fluid milk. (Holoman-Battelle)
W73-09333

DETERMINATION OF STRONTIUM-90 IN WATER: COLLABORATIVE STUDY,
Environmental Protection Agency, Winchester, Mass. Quality Control Service.
E. J. Baratta, and F. E. Knowles, Jr.
Journal of the Association of Official Analytical Chemists, Vol 56, No 1, p208-212, January 1973. 3 tab, 5 ref.

Descriptors: *Water analysis, *Pollutant identification, Methodology, Strontium radioisotopes, Chemical analysis, Aqueous solutions, Chemical precipitation.
Identifiers: *Collaborative studies, *Interlaboratory studies, *Sr-90, Method evaluation, Precision, Y-90, Yttrium radioisotopes, Accuracy.

A procedure involving carbonate precipitation and purification with nitric acid was evaluated by 11 collaborators for the determination of strontium-90 in water. Four 1050-ml samples were analyzed by each collaborator. Unknown to the collaborators, these samples consisted of 2 sets of similar, but not identical, samples. The request was to perform single analyses, using the procedure without modification. The ingrowth level of yttrium-90 was counted and used to calculate the strontium-90 activity present. The accuracy of the method ranged from 9 to 16 percent and within-laboratory precision ranged from 13 to 19 percent for strontium-90 levels of 28.2 to 99.6 pCi/L. A slight bias on the low side, caused by individual laboratory techniques, was not considered serious. The method has been adopted as official first action. (Holoman-Battelle)
W73-09334

ION EXCHANGE DETERMINATION OF STRONTIUM-89 AND STRONTIUM-90 IN MILK: COLLABORATIVE STUDY,
Environmental Protection Agency, Winchester, Mass. Quality Control Service.
E. J. Baratta, and F. E. Knowles, Jr.
Journal of the Association of Official Analytical Chemists, Vol 56, No 1, p 213-218, January 1973. 5 tab, 2 ref.

Descriptors: *Ion exchange, *Milk, *Pollutant identification, Methodology, Strontium radioisotopes, Laboratory tests, Chemical analysis, Aqueous solutions, Separation techniques, Radioactivity.
Identifiers: *Sr-89, *Sr-90, *Collaborative studies, Precision, Method evaluation, Interlaboratory studies, Accuracy, Yttrium radioisotopes, Y-90, Recovery, Errors.

A method for the determination of strontium-89 and strontium-90 in milk, involving ion exchange and purification with nitric acid, was evaluated by 11 collaborators. The accuracy of the method for strotium-89 ranged from 2 to 56 percent and the within-laboratory precision ranged from 11 to 76 percent for a concentration range of 68-480 pCi/L; values for strontium-90 in a concentration range of 50.2-116.2 pCi/L were 6.4 to 10 and 4 to 11 percent, respectively. The slight bias on the high side for strontium-90 was not considered serious. The collaborators had difficulty with strontium-89 analyses, as shown by the high precision and accuracy estimation values. (Holoman-Battelle)
W73-09335

ECOLOGICAL OBSERVATIONS ON HETEROTROPHIC, METHANE OXIDIZING AND SULFATE REDUCING BACTERIA IN A POND,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
Th. E. Cappenberg.
Hydrobiologia, Vol 40, No 4, p 471-485, December 15, 1972. 7 fig, 2 tab, 22 ref.

Descriptors: *Aquatic bacteria, *Sulfur bacteria, Ecological distribution, *Temporal distribution, *Methane bacteria, *Seasonal, Dissolved oxygen, Sulfates, Hypolimnion, Methane, Epilimnion, Aerobic bacteria, Hydrogen ion concentration, Eutrophication, Anaerobic bacteria, Water sampling, Water temperature, Gas chromatography, Volumetric analysis, Spring, Summer, Autumn, Winter, Oxidation, Reduction (Chemical).
Identifiers: *Heterotrophic bacteria, Vertical distribution, Metalimnion, Substrate utilization, Microaerophiles, Lake Vechten, Valas Test Water Collector, Culture media, Membrane filters, Counting, Oxygen electrode, Flame ionization gas chromatography.

Numbers of heterotrophic, methane oxidizing and sulfate reducing bacteria were counted in Lake Vechten and a dynamic distribution pattern was found. A maximum of heterotrophs (numbers of greater than or equal to one billion bact./l) occured in the deepest part of the lake in spring and in the metalimnion during summer-stratification. These bacteria use nearly all available oxygen in the hypolimnion. It was found that the concentration of available organic material and the oxygen tension caused the numbers of heterotrophs in the metalimnion to be high. The maximal numbers of methane oxidizers (number of greater than or equal to 500,000 bact./l) were found at a depth of maximal methane concentration: the de-oxygenated hypolimnion. Preliminary evidence indicated that these organisms were facultative methane oxidizers and must be regarded as microaerophyllics. By oxidizing methane they removed the residual oxygen under the metalimnion. The sulfate reducing bacteria could be observed in the hypolimnion. The sulfate reducing bacteria could be observed in the hypolimnion only. Decreased SO4- (2-) concentration and increased numbers of bacteria were found in the bottom water. An association between the methane oxidizers and the sulfate reducers could be deduced. It was assumed that favourable redox requirements for obligate anaerobic sulfate reducers were the results of the activities of the methane oxidizing bacteria. The dynamic distribution equilibrium of the investigated groups of bacteria was disturbed by the autumn turn-over. The heterotrophic and methane oxidizing bacteria decreased in number and were equally distributed; no sulfate reducers could be detected in the free water. (Holoman-Battelle)
W73-09337

LIMNOLOGICAL INVESTIGATIONS IN THE AREA OF ANVERS ISLAND, ANTARCTICA,
Virginia Polytechnic Inst. Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-09339

POLYCHAETOUS ANNELIDS COLLECTED BY 'UMITAKA-MARU' FROM THE ARABIAN GULF,
Kuwait Univ. Dept. of Zoology.
M-B. M. Mohammad.
Hydrobiologia, Vol 40, No 4, p 553-560, December 15, 1972. 10 ref.

Descriptors: *Annelids, *Invertebrates, *Systematics, Marine animals, Water temperature, Salinity, Dissolved oxygen.
Identifiers: *Polychaetes, *Arabian Gulf, *Pelagic animals, Speciation, Lepidonotus carinulatus, Euphrosine foliosa, Plotohelmis capitata, Tomopteris, Leocrates claparedii, Syllis gracilis, Autolytus cf. A. lonistaffi, Aglaophamus, Glycera prashadi, Eunice antennata, Eunice indica, Palola siciliensis, Lysidice ninetta, Chaetopterus variopedatus, Ammotrypane aulogaster, Pista cristata, Polycirrus coccineus.

Seventeen species of polychaetous annelids, belonging to 12 families, have been identified from a collection made by the Japanese research 'Umitaka-Maru' in December 1968 from the Arabian Gulf. The material was collected from 12 sites along the coasts of Kuwait, Bahrain, Qatar, and the Trucial States. During the collection period, the mean sea water temperature, salinity, and dissolved oxygen near the bottom (depth, 15 to 20 metrics) at the stations at which the polychaetes were collected were in the neighborhood of 24.1 degrees C, 41.0 ppt, and 4.6 cc/1, respectively (Tokyo University of Fisheries and Kuwait Institute for Scientific Research, 1969). Two pelagic families (Alciopidae, Tomopteridae) and five species (Plotohelmis capitata, Tomopteris sp., Autolytus cf. A. longistaffi, Lysidice ninetta, Pista cristata) have been recorded new to the fauna of the Arabian Gulf. (Holoman-Battelle)
W73-09341

DIATOMS FROM THE DEVIL'S HOLE CAVE FIFE, SCOTLAND,
Elm Bank, Hawick (Scotland).
J. R. Carter.
Nova Hedwigia, Vol 21, Nos. 2-4, p657-681, 1971. 113 fig, 37 ref.

Descriptors: *Diatoms, *Chrysophyta, Aquatic algae, *Systematics, Ecological distribution, *Marine algae, Pollutant identification.
Identifiers: *Speciation, *Scotland, *Devil's Hole Cave (U.K), Achnanthes spp., Amphora granulata, Caloneis spp., Cymbella spp., Denticula tenuis, Diploneis ovalis, Eunotia spp., Fragilaria spp., Gomphonema spp., Licmophora oedipus, Melosira dickiei, Navicula spp., Nitzschia spp., Pinnularia spp., Pleurosigma rigidum, Stauroneis leguman, Synedra spp.

Material collected by the late Mr. George West of the University College, Dundee, in the Devil's Hole Cave in Kincraig Hill, Fife, Scotland has been examined for the presence of diatoms. The preparations yielded an abundance of small and delicately structured forms, several of which could not be identified with certainty. A total of 94 species and other subcategories are reported, five of which are new to science. Caloneis borealis, Cymbella diavola, Navicula variolinea, Navicula vula, and Nitzschia disputata nov. spp. are described. The types of the new species are lodged in the British Museum (No. 77777 and 77778). (Holoman-Battelle)
W73-09343

ADDITIONS TO THE MARINE ALGAL FLORA OF GHANA I.
Ghana Univ., Legon. Dept. of Botany.
D. M. John, and G. W. Lawson.
Nova Hedwigia, Vol 21, Nos. 2-4, p817-842, 1971. 14 fig, 94 ref.

Descriptors: *Marine algae, Plant morphology, Ecological distribution, Spatial distribution, *Systematics, *Chlorophyta, *Phaeophyta, *Rhodophyta, Atlantic Ocean, Africa, Pollutant identification.
Identifiers: *Ghana.

A list is given of 36 new records of marine algae from the Ghanaian coast. It includes information in the annotations on their morphology and other features of taxonomic interest together with notes on their localities and world distributions. A large proportion of these new records are of plants confined to the sublittoral (21) and this reflects the flora of new areas where collecting has now been made possible by aqua lung diving. Thirteen of these new records are of species not previously known from West Africa and 5 of these plants are new to the Atlantic Ocean. (Holoman-Battelle)
W73-09344

THE LIFE-HISTORY OF SPHACELARIA FURICIGERA KUTZ. (PHAEOPHYCEAE) II. THE INFLUENCE OF DAYLENGTH AND TEMPERATURE ON SEXUAL AND VEGETATIVE REPRODUCTION,
Groningen Rijksuniversiteit, Haren (Netherlands). Afdeling Plantenoecologie.
For primary bibliographic entry see Field 05C.
W73-09345

USE OF A COMMERCIAL DREDGE TO ESTIMATE A HARDSHELL CLAM POPULATION BY STRATIFIED RANDOM SAMPLING,
Rhode Island Dept. of Natural Resources, Providence. Div. of Fish and Wildlife.
For primary bibliographic entry see Field 05B.
W73-09348

AN INSTRUMENT FOR MEASURING CONDUCTIVITY PROFILES IN INLETS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
D. M. Farmer, and T. R. Osborn.
Journal of the Fisheries Research Board of Canada, Vol 29, No 12, p 1767-1769, December 1972. 6 fig, 1 ref.

Descriptors: *Conductivity, *Estuaries, *Monitoring, *Instrumentation, *Profiles, *Measurement, *Density stratification, *Inlets (Waterways), Automation, On-site data collections, Physical properties, Operation, Design, Calibration.
Identifiers: Sensors, Digital chart recorder.

A description is given of an instrument for monitoring conductivity profiles in the upper few meters of stratified estuarine waters. Watertight containers of P.V.C. tubing separately house the batteries and the electronics. Four low specific gravity 6-volt, lead-acid batteries provide the power. Each probe was calibrated by immersing it in a large container of salt water of known temperature, for which the conductivity could be determined accurately by other means. After noting the output, the cell was removed from the salt solution and a conducting loop in series with a potentiometer was passed through the probe. In this way, it was possible to find a cell constant, Kc, in terms of the solution conductivity, Sc, and the 'equivalent resistance', Req, of the potentiometer that yielded the same output as that obtained with the cell in solution. The instrument measures the electrical conductivity of seawater at 14 depths by successively interrogating, for 1 min at a time, each of the 14 conductivity probes on the chain. There is a 15th probe inside the instrument housing which serves as a check on any drift in the response of the electronics. Output from the conductivity measuring circuit is fed to a Rustrak chart recorder. A converted fiberglass marker buoy with a lid at one end and an inner sheath of plastic foam affords shock protection and flotation for the battery and instrument cases. The instrument runs for one week between chart replacements. Contours of constant conductivity derived from the chart records have provided a graphic description of wind effects in Alberni Inlet. (Holoman-Battelle)
W73-09349

MERCURY REMOVAL FROM FISH PROTEIN CONCENTRATE,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
L. W. Regier.
Journal of the Fisheries Research Board of Canada, Vol 29, No 12, p 1777-1779, December 1972. 3 tab, 4 ref.

Descriptors: *Mercury, *Solvent extractions, *Separation techniques, Methodology, Heavy metals, Alcohols, Fish, Marine fish.
Identifiers: *Fish protein concentrate, *Swordfish, Halifax propanol extraction method, Organic solvents, Ethyl alcohol, Isopropyl alcohol, Biological samples, Xiphias gladius, Hydrochloric acid.

The potential reclamation of mercury contaminated proteinaceous food by an extraction procedure such as employed in marking fish protein concentrate was investigated. Pieces of frozen swordfish (Xiphias gladius) known to contain high levels of mercury were thawed in air at room temperature, chopped, and deboned. A portion of the deboned meat was refrozen in polyethylene bags and kept at -18 C. The remainder of the meat was used to make FPC in the pilot plant by the Halifax Isopropanol (IPA) extraction method (Power 1962). Samples were taken of the filter cake after each of the three extractions and of the product after drying. These samples, together with a sample of the deboned meat, were analyzed for mercury by the atomic absorption method (Uthe et al., 1970). Since the regular process did not remove the Hg, the complete FPC was re-extracted with alcohol acidified with HC1. The addition of hydrocholoric acid to the isopropanol extractant was found to give removals as high as 93 percent from dry swordfish protein concentrate. Preliminary studies of the variables indicated acid concentration, kind of alcohol (ethanol and isopropanol), alcohol concentration, extractant volume, and number of extractions were important in the extraction. (Holoman-Battelle)
W73-09351

FINE STRUCTURE OF SOME BRACKISH--POND DIATOMS,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
R. E. Hargraves, and M. Levandowsky.
Nova Hedwigia, Vol 21, Nos 2-4, p 321-336, 1971. 34 fig, 35 ref.

Descriptors: *Electron microscopy, *Diatoms, *Brackish-water, *Chrysophyta, *Systematics, *Ecological distribution, Marine algae, Nannoplankton, Eutrophication, Water temperature, Salinity, Hydrogen ion concentration, Phytoplankton, Water properties, Summer, Pollutant identification.
Identifiers: *Ultranstructure, Sample preparation, Speciation, Achnanthes hauckiana, Amphiprora hyalina, Amphora tenuissima, Bellerochea, Cyclotella cryptica, Cyclotella meneghiniana, Cylindrotheca closterium, Fragilaria pinnata, Fragilaria virescens var. subsalina, Navicula cryptocephala, Navicula cryptolyra, Nitzcschia frustulum, Nitzschia ovalis, Skeletonema costatum, Thalassionema nitzschioides, Thalassiosira alleni, Thalassiosira pseudonana.

Samples of diatoms ere taken during summer from a brackish pond on the northern shore of Long Island, New York, 0.25 mile west of Mt. Sinai Harbor mouth. The diatoms were examined in the Philips EM-200 electron microscope at 80 kv as carbon replicas and as direct preparations of acid cleansed unreplicated frustules. Some of the taxa

had previously been observed by electron microscopy, while others were new distributional records. Representative summer conditions of the pond are tabulated. (Holoman-Battelle)
W73-09353

ALTHORNIA CROUCHII GEN. ET SP. NOV., A MARINE BIFLAGELLATE FUNGUS,
Portsmouth Polytechnic (England). Dept. of Biological Sciences.
E. B. G. Jones, and D. J. Alderman.
Nova Hedwigia, Vol 21, Nos 2-4, p 381-399, 1971. 33 ref.

Descriptors: *Marine fungi, *Plant morphology, *Pollutant identification, *Systematics, Electron microscopy, Marine plants.
Identifiers: *Althornia crouchii, *Ultrastructure, Sample preparation, Light microscopy, Speciation.

A new species of marine fungus has been described and a new genus established. The morphological details observed by light microscopy are described. For electron microscopic investigations the following procedure was used. The fungus was grown in yeast extract peptone seawater broth for 7-14 days at a temperature of 25 C. One millilitre of the medium containing mature sporangia was transferred to 50 ml of 0.05 percent sodium glutamate in seawater in a 250 ml Erlenmeyer flask. Zoospores were discharged freely within 6-18 hours. The zoospores were fixed in 2 percent osmium tetraoxide fumes, dried, and shadowed with gold-palladium. An alternate fixation method utilized 4 percent glutaraldehyde. The morphology of the zoospore and sporangium is described in detail. (Holoman-Battelle)
W73-09354

HYPHOMYCETES UTILIZING NATURAL GAS,
University of Western Ontario, London. Dept. of Plant Sciences; and University of Western Ontario, London. Faculty of Engineering Science.
For primary bibliographic entry see Field 05B.
W73-09355

DEGRADATION OF POLYCHLORINATED BIPHENYLS BY TWO SPECIES OF ACHROMOBACTER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W73-09356

ULTRASTRUCTURE OF TWO SPECIES OF OIL-DEGRADING MARINE BACTERIA,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 05B.
W73-09357

QUANTAL RESPONSE ANALYSIS FOR A MIXTURE OF POPULATIONS,
Exter Univ. (England).
J. R. Ashford, and P. J. Walker.
Biometrics, Vol 28, No 4, p 981-988, December 1972. 1 fig, 1 tab, 7 ref.

Descriptors: *Bioassay, *Statistical methods, *Estimating, *Toxicity, Population, Mathematical models.
Identifiers: *Data interpretation.

This paper is concerned with the biological assay of a mixture of populations which cannot be differentiated on the basis of their external characteristics. It is shown that the overall dosage-response relation may be expressed in terms of the corresponding relations for the separate populations and of the proportion of each present in the mixture. The derivation of the maximum likelihood (ML) estimates of the unknown parameters is then described and the proposed methods are illustrated by an example of the analysis of a quantal assay of trypanosomes involving a mixture of two distinct populations. The calculation of the parameter estimates involved an iterative procedure which is only practicable using a digital computer, and it is pointed out that the quantity and quality of the experimental data must conform to very stringent criteria if an analysis is to be worthwhile. (Little-Battelle)
W73-09363

BAYESIAN ESTIMATION AND DESIGN OF EXPERIMENTS FOR GROWTH RATES WHEN SAMPLING FROM THE POISSON DISTRIBUTION,
American Cyanamid Co., Stamford, Conn.
D. W. Behnken, and D. G. Watts.
Biometrics, Vol 28, No 4, p 999-1009, December 1972. 2 fig, 3 tab, 6 ref.

Descriptors: *Estimating, *Growth rates, *Algae, *Statistical methods, Bioassay, Sampling.
Identifiers: *Data interpretation, *Experimental design, Poisson distribution, Selenastrum capricornutum.

Data on algal growth rates were used to investigate the problem of estimating the growth rate parameter, beta, for a process with an expected value lambda sub i equal to alpha e to the beta t sub i power. This equation produces data from a Poisson distribution p of lambda sub i at time t sub i (i equals 1,2, ..., n). The posterior distribution for beta is derived, and an approach to designing experiments in this situation is suggested. (Little-Battelle)
W73-09364

MICROBIAL POPULATION OF FEEDLOT WASTE AND ASSOCIATED SITES,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
For primary bibliographic entry see Field 05B.
W73-09366

ENTEROBACTERIA IN FEEDLOT WASTE AND RUNOFF,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
For primary bibliographic entry see Field 05B.
W73-09367

WATER POLLUTION MONITORING,
California Univ., Berkeley. Dept. of Geoscience Engineering.
U. Conti.
Industrial Photography, Vol 21, No 7, p 30-31, 49, July 1972.

Descriptors: *Water pollution, *Monitoring, *Automation, *Photography, *Water properties, *Mechanical equipment, Water quality, Physical properties, Chemical properties, Cameras, Reliability, Depth, Dissolved oxygen, Water temperature, Salinity, Hydrogen ion concentration, Chlorides, Ions, Sulfides, Ambient light.
Identifiers: *Sensors.

Members of the Geoscience Engineering Department at the University of California, Berkeley, are testing an automatic, continuous, in situ water pollution monitoring system which promises to be both more economical and easier to operate than a comparable system already in use. This system consists of a towed vehicle about four feet long, capable of following a given vertical path (constant depth of constant distance from the bottom) and housing a number of sensors. The parameters measured are depth, dissolved oxygen, temperature, salinity, pH, chloride ion activity, sulfide ion activity and ambient light. The system is powered by its own battery pack and does not require an electrical cable incorporated in the tow line. The problem of recording the eight parameters (plus two internal checks and time for a total of 11 parameters) has been solved very economically with a movie camera by translating the various parameters to voltages, which are displayed sequentially in alphanumeric form on a Weston Model 1292 digital voltmeter. A Bell and Howell 16mm magazine camera takes single-frame pictures of the digital voltmeter, of an electric watch and of the scanner readout which shows which parameter is being measured. The camera has been modified to be motor driven at a speed of 20 frames per minute. As no changes have been made on the shutter mechanism, each frame is exposed for about 1.5 seconds. A standard 50-foot 16mm magazine contains 2000 frames or data points, and supplies more than 1.5 hours of continuous record. The film is read on a small standard editor, and the data from one 50-foot reel can be transcribed onto tables or computer cards in about two hours. The main advantages of this system are great reliability, ease of operation and low cost. The entire system has been tested extensively at sea in Mexico and in the San Francisco Bay. The recording system worked flawlessly, recording very small changes in the measured parameters. (Holoman-Battelle)
W73-09369

CALIBRATING PLATINUM RESISTANCE THERMOMETERS,
Westinghouse Electric Corp., Pittsburgh, Pa.
R. P. Benedict, and R. J. Russo.
Instruments and Control Systems, Vol 45, No 10, p 55-56, October 1972. 1 fig, 3 tab, 5 ref.

Descriptors: *Calibrations, *Temperature, Measurement, Thermometers.
Identifiers: *Platinum thermometers, Resistance thermometers.

Replacement of the International Practical Temperature Scale of 1948 (IPTS-48) with IPTS-68 requires that the calibration of platinum resistance thermometers be changed. Consequently, the Callender interpolation equation has been revised for determining calibration constants from experimental data in the temperature range between the ice and antimony points. A correction factor is applied to the equation to satisfy the new scale. (Little-Battelle)
W73-09370

TEMPERATURE COEFFICIENTS AND THEIR COMPENSATION IN ION-SELECTIVE SYSTEMS,
Foxboro Co., Mass.
L. E. Negus, and T. S. Light.
Instrumentation Technology, Vol 19, No 12, p 23-29, December 1972. 2 fig, 4 tab, 16 ref.

Descriptors: *Thermal properties, *Instrumentation, *Mathematical studies, Temperature, Laboratory equipment, Research equipment, Temperature control, Electrochemistry.
Identifiers: *Ion selective electrodes, *Temperature coefficients, *Temperature compensation, Sensors, Silver electrode, Chloride electrode, Bromide electrode, Iodide electrode, Sulfide electrode, Cyanide electrode, Copper electrode, Hydrogen electrode, Sodium electrode, Fluoride electrode.

Temperature effects in ion-selective electrode systems are discussed as well as compensation techniques for these effects. The electrodes discussed fit in either of the following categories: 1. The cell potential and thermal characteristics are independent of any internal filling solution (solid-state membrane electrodes for Ag, chloride, bromide, iodide, sulfide, cyanide, and Cu). 2. The cell potential and thermal characteristics are dependent upon the internal filling solution (elec-

trodes for pH, Na, fluoride, Ca, Mg, and water hardness). Application of such electrodes is aided if there is exact information available on their thermal characteristics. It has been shown that those characteristics can be derived from the Nernst equation and from experimental data, and how various thermal effects can be minimized. (Holoman-Battelle)
W73-09371

AQUATIC SEDIMENT AND POLLUTION MONITOR,
R. Y. Anderson.
U. S. Patent No 3,715,913. 6 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 907, No 2, p 339, February 13, 1973.

Descriptors: *Patents, *Sampling, Pollutants, Sediments, *Monitoring, *Instrumentation, Water pollution, Water quality, *Pollutant identification.

This invention relates to the collection and measurement of the natural materials and polluting substances that accumulate in bodies of water. The device is an elongated, vertically alignable collecting tube having an open upper end and a closed lower end for collecting over a period of time. A funnel-shaped magnifying cone is positioned with the small diameter end extending into the open end to magnify the collected matter. A baffle prevents large organisms from entering the tube and helps to minimize turbulence within the tube. Marking material settles as a distinct layer on the settled material. The marking material is held in a rotatable magazine which has many dispensing chambers. There is a thermostat which activates a different dispensing device every time the temperature passes a different preset level. After a given period of time, which may be several months or several years, the monitor may be recovered for study. The collecting tube will contain layers of material that correspond to the preset interval of a timing mechanism. (Sinha-OEIS)
W73-09390

WATER SAMPLING DEVICE,
Department of the Navy, Washington, D.C. (assignee)
For primary bibliographic entry see Field 07B.
W73-09401

FLIGHT TEST OF AN OCEAN COLOR MEASURING SYSTEM,
TRW Systems Group, Redondo Beach, Calif. Display and Imaging Dept.
For primary bibliographic entry see Field 07B.
W73-09440

NATURAL BACKGROUND CONCENTRATION OF MERCURY IN SURFACE WATER OF THE ADIRONDACK REGION, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02K.
W73-09449

DETERMINATION OF SILVER IN SOILS, SEDIMENTS, AND ROCKS BY ORGANIC-CHELATE EXTRACTION AND ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W73-09451

HYDROGEOLOGICAL CRITERIA FOR EVALUATING SOLID-WASTE DISPOSAL SITES IN JAMAICA AND A NEW WATER SAMPLING TECHNIQUE,
Geological Survey of Jamica, Kingston.
For primary bibliographic entry see Field 05B.
W73-09452

HAIR AS A BIOPSY MATERIAL,
Agricultural Research Service, Grand Forks, N. Dak. Human Nutrition Lab.
L. M. Klevay.
Archives of Environmental Health, Vol 26, p 169-172, April 1973. 1 fig, 3 tab, 28 ref.

Descriptors: *Biopsy, *Lead, *Spectrometry, *Pollutant identification, Biochemistry, Analytical techniques, Laboratory tests, Measurements, Evaluation, Pathology, Path of pollutants.

The possibility is presented that hair could be used as an easily acquired, efficient biopsy material for the determination of exposure to quantities of lead. This study was appended to the 1967 Nutritional Survey of the Republic of Panama. Hair was collected and analyzed by atomic absorption spectrometry. For ten replicate analyses on a single hair sample with a mean lead concentration of 4.0 micrograms/gm, the standard deviation was 1.0 microgram/gm and the standard error was 0.3 microgram/gm. Data was separated and analyses for variance according to sex, age and location of residence were performed. Location appeared to be the most important factor in lead concentration differences. Hair and bone lead concentration correlations from other studies were discussed. It was concluded that if hair is used as a biopsy material for assessment of human exposure to lead in the environment, only individuals or groups which have been matched for age, sex, and place of residence may be compared. (Jerome-Vanderbilt)
W73-09467

DETERMINATION OF MERCURY IN SOILS BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Department of Scientific and Industrial Research, Petone (New Zealand).
B. G. Weissberg.
Economic Geology, Vol 66, No 7, p 1042-1047, 1971. 2 fig, 4 tab, 16 ref.

Descriptors: *Mercury, *Analytical techniques, *Soil, *Soil investigations, Soil chemistry, Laboratory equipment, Spectrophotometry, Sampling, Testing, Pollutant identification, Metals, Absorption, Heavy metals.
Identifiers: *Atomic absorption spectroscopy, Organomercurials, *New Zealand.

Mercury analyses of acceptable accuracy for geochemical prospecting were obtained on ten New Zealand soil samples, containing 2 to 10% of total organic matter, using a simple single beam atomic absorption spectrometer combined with a cold gold filter that removed mercury from the vapors released on heating the sample. A modification of the analytical procedure, using two gold filters heated to 170 degrees C during mercury collection, gave results lower than the values obtained by an acid oxidizing digestion of the samples with subsequent evolution of mercury from the solutions by reduction with stannous chloride. These low results suggest that as much as 30% of the mercury in the soils tested is present as volatile mercury-organic compounds. (Oleszkiewicz-Vanderbilt)
W73-09471

AVAILABILITY OF MANGANESE AND IRON TO PLANTS AND ANIMALS,
West Virginia Univ., Morgantown. Dept. of Animal Industries and Veterinary Science.
For primary bibliographic entry see Field 02K.
W73-09474

DETERMINATION OF SUBMICROGRAM QUANTITIES OF MERCURY IN PULP AND PAPERBOARD BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Weyerhaeuser Co., Longview, Wash. Analytical and Test Dept.
D. C. Lee, and C. W. Laufmann.
Analytical Chemistry, Vol 43, No 8, p 1127-1129, July 1971. 2 fig, 2 tab, 5 ref.

Descriptors: *Evaluation, *Mercury, *Pulp and paper industry, *Spectrophotometry, Chemistry, Chemical analysis, Analytical techniques, Absorption, Instrumentation, Solvents, Acids, Laboratory tests.

A procedure for analyzing pulp and paperboard for concentrations of mercury is presented in which the loss of mercury is virtually eliminated. The wet oxidation mixture of nitric acid (70%) and hydrochloric acid (37%) is prepared in a 1:1 ratio forming aqua regia. Aqua regia will react with pulp or paperboard to break down inorganic forms of mercury as well as the organic materials, to form soluble mercuric compounds, leaving behind cellulose fibers. The sensitivity of the proposed method will depend primarily on the dimensions of the absorption cell used. Using a 10 cm cell with the Perkin-Elmer Model 303 Atomic Absorption Spectrophotometer, as little as 5 nanograms of mercury can be detected with very little difficulty. The apparatus, reagents, instrument settings, calibration and experimental procedure are presented. Inasmuch as the determination of mercury in this method is based upon peak height rather than peak area, it is very important that all conditions of analysis be carefully controlled. (Jerome-Vanderbilt)
W73-09477

NICKEL EXPLORATION BY NEUTRON CAPTURE GAMMA RAYS,
Geological Survey, Washington, D.C.
F. E. Senftle, P. F. Wiggins, D. Duffey, and P. Philbin.
Economic Geology, Vol 66, No 4, p 583-590, 1971. 8 fig, 2 tab, 14 ref.

Descriptors: *Analytical techniques, *Neutron activation analysis, *Nickel, *Exploration, Chemical analysis, Metals, Geology, Measurements, Evaluation, Boreholes, Geophysics, Subsurface investigations, Gamma rays.

An in situ analytical technique which appears feasible for nickel detection is presented in this report. This method depends on the very high energy gamma rays emitted when nickel absorbs a thermal or low energy neutron and is made possible by the advent of large lithium drifted germanium, Ge (Li), detectors with their excellent resolution. Analysis down to 0.1 percent nickel generally compared well with chemical analysis. Measurements using the technique as a detection method were made on an artificially prepared surface deposit of low grade (about 1%) nickel ore and also in a test bore hole in the same ore. Nickel was easily detected in both cases. (Jerome-Vanderbilt)
W73-09480

DETERMINATION OF MERCURY IN NATURAL WATERS AND EFFLUENTS BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Central Inst. for Industrial Research, Oslo (Norway).
S. H. Omang.
Analytica Chimica Acta, Vol 53, p 415-419, 1971. 1 tab, 10 ref.

Descriptors: *Spectrophotometry, *Water analysis, *Mercury, Analytical techniques, Chemical analysis, Absorption, Water pollution, Effluents, Discharge (Water), Sampling, Laboratory tests, Evaluation, Wastes.
Identifiers: *Atomic absorption spectroscopy.

Analyses of water and effluents for mercury content have been reported, but the sensitivity of the methods used has been rather low. Modifications and refinements developed in order to reach a detection limit of 0.02 micrograms of mercury per

liter of substance analyzed are described. The simplest way of insuring a quantitative determination is to digest the sample with permanganate-sulphuric acid. This mixture in considerably higher concentration also will decompose organic mercurials such as methyl- and phenylmercury. Sample treatment, solution stability and reagent contamination are discussed and experimental instrumentation and procedures are presented. After the digestion of the organic matter, analyses of the samples was carried out by the cold-vapor atomic absorption technique. (Jerome-Vanderbilt)
W73-09481

SPECTROPHOTOMETRIC DETERMINATION OF TRACE AMOUNTS OF MERCURY (II) BY EXTRACTION WITH BINDSCHEDLER'S GREEN,
Tottori Univ. (Japan). Faculty of Education.
M. Tsubouchi.
Analytical Chemistry, Vol 42, No 9, p 1087-1088, August 1970. 2 tab, 11 ref.

Descriptors: *Spectrophotometry, *Mercury, *Laboratory tests, Chemical analysis, Analytical techniques, Trace elements, Separation techniques, Evaluation, Measurements, Water pollution, Metals.

Bindschedler's green leuco base (BG) is known to be oxidized to form the green dyestuff cation (BG+). Mercury (II) was converted into a bromo-complex anion and extracted into 1, 2-dichloroethane with the BG (+). This system was studied to establish a method for the determination of mercury (II). The experimental apparatus, reagents and procedures for spectrophotometric determination are presented. In the absence of mercury (II), no significant color was extracted into dichloroethane, while in its presence a green color was observed in the organic layer. The absorbance maximum of the extracts was at 740 millimicrons. Ammonium persulfate was found to be the most effective reagent for oxidizing BG and it gave a lower absorbancy of the reagent blank. The effects of various ions were tested and the results presented in a table. The method was applied on waste water containing ethylmercuric phosphate and the absorbance measurement was made against a reagent blank. The results are presented in a table. (Jerome-Vanderbilt)
W73-09482

THE EXAMINATION OF ORGANOMERCURY COMPOUNDS AND THEIR FORMULATIONS BY THIN-LAYER CHROMATOGRAPHY,
Boots Pure Drug Co. Ltd., Nottingham (England). Quality Control Analytical Research.
G. W. Johnson, and C. Vickers.
Analyst, Vol 95, p 356-362, April 1970. 1 fig, 4 tab, 6 ref.

Descriptors: *Mercury, *Chromatography, *Seed treatment, Pollutant identification, Laboratory equipment, Analytical techniques, Heavy metals, Pesticides, Testing.
Identifiers: *Thin-layer chromatography, *Organomercurials.

Thin-layer chromatographic methods for the separation and identification of organomercury compounds have been developed and applied to the examination of commercial-quality organomercurials and seed-dressing formulations. The organomercury compounds, in the form of their chlorides, are separated on silica gel by continuous development with cyclohexane - acetone (4 + 1), and detected as orange - brown spots by spraying the plate successively with copper sulphate and sodium sulphite - potassium iodide reagents. A method for the semi-quantitative assay of inorganic mercury (as mercury (II) in the compounds, at levels between 1 and 14 percent, is also described. Little or no mercury-containing impurity was found in samples of phenylmercury nitrate, phenylmercury acetate and phenylmercury chloride examined, but methoxyethylmercury chloride and ethoxyethylmercury chloride samples contained as many as five mercury-containing impurities and up to 12 percent of inorganic mercury compounds. (Oleszkiewicz-Vanderbilt)
W73-09487

DETERMINATION OF METHYLMERCURY IN FISH AND IN CEREAL GRAIN PRODUCTS,
Food and Drug Directorate, Ottawa (Ontario). Reasearch Labs.
W. H. Newsome.
Journal of Agriculture and Food Chemistry, Vol 19, No 3, p 567-569, March 1971. 2 tab, 5 ref.

Descriptors: *Mercury, *Gas chromatography, *Analytical techniques, *Pollutant identification, Separation techniques, Fish, Foods, Fish toxins, Water pollution, Laboratory equipment.
Identifiers: *Methylmercury, *Organomercurials, Cereal grain products.

Methylmercury was determined in fish by gas-liquid chromatography following a modification of existing extraction procedures. The method obviated centrifugation to assist phase separation by incorporating a filtration step and by the use of hydrobromic rather than hydrochloric acid. Overall recoveries were 94% plus or minus 6% for whitefish and 98% plus or minus 6% for cod of methylmercury. Methylmercury was also determined in wheat flour and ground oats by extraction with a benzene-formic acid mixture followed by purification and gas-liquid chromatography. Interfering substances were removed from the extracts by column chromatography on silicic acid and partitioning with cysteine acetate solution. The method is sensitive in the 0.01 - 0.90 ppm range, with a mean recovery generally greater than 95%. (Oleszkiewicz-Vanderbilt)
W73-09488

MERCURY IN THE ATMOSPHERE,
For primary bibliographic entry see Field 05B.
W73-09489

ZINC UPTAKE IN NEOCOSMOSPORA VASINFECTA,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
W. H. N. Paton, and K. Budd.
Journal of General Microbiology, Vol 72, Part I, p 173-184, 1972. 7 fig, 20 ref.

Descriptors: *Zinc, *Heavy metals, *Fungi, Adsorption, Metabolism, Growth rates, Temperature, Cytological studies, Nutrients, Model studies, Laboratory tests, Path of pollutants.
Identifiers: Zinc uptake, Nucleus, *Neocosmospora vasinfecta.

Mycelia of Neocosmospora vasinfecta harvested in mid-logarithmic phase absorb Zn (+2) from dilute solutions in the absence of growth. Zn (+2) uptake involves two phases: a rapidly established phase I believed to represent adsorption to negatively charged groups in the hyphal surface-membrane and a slowly established phase 2 which represents transport into the cytoplasm. Phase I is not influenced by low temperature, NaN3 or anaerobiosis applied for short periods, conforms to the Langmuir adsorption equation and is reduced in the presence of various other divalent cations. Phase 2 is strongly inhibited by low temperature, NaN3 and anaerobiosis and exhibits carrier-type kinetics. Electron microscopy of unstained material indicates that part at least of phase 2 Zn is deposited in the cytoplasm and nucleus. A model for the metabolic uptake of Zn (2+) involving phase I binding as a requisite preliminary process is suggested. (Oleszkiewicz-Vanderbilt)
W73-09491

PARTICLES CONTAINING LEAD, CHLORINE, AND BROMINE DETECTED ON TREES WITH AN ELECTRON MICROPROBE,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology.
G. H. Heichel, and L. Hankin.
Environmental Science and Technology, Vol 6, No 13, p 1121-1122, December 1972. 2 tab, 7 ref.

Descriptors: *Waste identification, *Lead, *Plant morphology, *Trees, Air pollution, Chemistry, Toxins, Gasoline, White pine trees, Public health, Spectrophotometry.
Identifiers: Automobile exhaust, Airborne lead particles.

Samples of branches 55 mm in diameter from a white pine tree situated 2 to 3 meters from densely traveled roadway, and samples of bark 4 mm thick from an elm tree .75 meter from a city street, were collected to analyze the amount and composition of the lead particulate matter imbedded on them. Analyses by atomic absorption spectrophotometry determined the lead content on the pine twig to be 120 micrograms of lead per gram of dry weight, while on the elm bark it was 108 micrograms of lead per gram of dry weight. Further analysis with an electron probe microanalyzer showed that although the lead content in the two samples differed greatly, the lead/chlorine/bromine ratio was similar. The lead composition of the particles imbedded on the tree bark was much the same as particles in automobile exhaust. Knowledge of the form and composition of lead residues is important to determine how lead affects plants, as some forms of lead are more toxic than others. (Jerome-Vanderbilt)
W73-09494

CONCENTRATIONS OF ARSENIC FROM WATER SAMPLES BY DISTILLATION,
McGill Univ., Montreal (Quebec). Dept. of Chemical Engineering.
E. J. Farkas, R. C. Griesbach, D. Schachter, and M. Hutton.
Environmental Science and Technology, Vol 6, No 13, p 1116-1117, December 1972. 1 tab, 11 ref.

Descriptors: *Analytical techniques, *Separation techniques, *Water quality, *Arsenic, Chemistry, Chemical engineering, *Distillation, Water pollution, Sampling.

Determination of the amount of arsenic in samples of drinking water is facilitated if the arsenic in the sample can first be concentrated into a smaller volume. The utility of the distillation method described in standard reference works was investigated. Optimum conditions for application of this method were determined based on experiments in which percentage recovery of the arsenic present in the original sample was measured as a function of the amounts of the reagents added to the original sample and of the volume of distillate collected. The acid concentration in particular influences the results quite markedly. Improvements in experimental technique are also described. The acid concentration necessary could be achieved by bubbling HCl gas into the sample. (Jerome-Vanderbilt)
W73-09495

SOME GENERAL AND ANALYTICAL ASPECTS OF ENVIRONMENTAL MERCURY CONTAMINATION,
Hope Coll., Holland, Mich.
D. H. Klein.
Journal of Chemical Education, Vol 49, No 1, January 1972 p 7-10, 1 tab, 10 ref.

Descriptors: *Analytical techniques, *Mercury, *Laboratory tests, Reviews, Chemistry, Heavy metals, Environment, Diseases, Evaluation, Spectrophotometry, Atmosphere, Air pollution, Water pollution, Food chains, Biota.

The object is to encourage chemists in undergraduate institutions to develop programs in which students can participate in the collection of much needed data on the presence of mercury and other heavy metals in the environment. In order to further this goal the author has conducted a broad discussion of relatively simple analytical methods which can be performed with inexpensive equipment by small groups on readily available samples. The reduction-aeration-flameless atomic absorption technique of analysis is discussed briefly along with modifications in digestion procedures which make it applicable to the analysis of fish tissue or brines, sludges, air, water and other substances. Problems of initially erratic results seem to be overcome by operator experience and breaking in of the apparatus. Preparation of standards, reagent contamination and absorption and volatility of the sample are discussed. (Jerome - Vanderbilt)
W73-09502

NOVEL WET-DIGESTION PROCEDURE FOR TRACE-METAL ANALYSIS OF COAL BY ATOMIC ABSORPTION,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Mining and Safety Research Center.
A. M. Hartstein, R. W. Freedman, and D. W. Platter.
Analytical Chemistry, Vol 45, No 3, p 611-614, March 1973. 1 fig, 3 tab, 8 ref.

Descriptors: *Chemical analysis, *Trace elements, *Separation techniques, *Spectrophotometry, *Laboratory tests, Chemistry, Analytical techniques, Testing procedures, Sampling, Evaluation, Research facilities, Instrumentation.

A procedure is presented which permits the rapid and reliable quantitative determination of trace elements in coal at sample weights as low as 10 mg. The organic matter in coal is destroyed by fuming nitric acid, and the dissolution of siliceous material is accomplished by hydrofluoric acid. Thus a relatively concentrated solution is provided having little matrix interference for atomic absorption and several other types of analysis. Instrumental conditions are presented for determination of Be, Cd, Ca, Co, Cu, Li, Mg, Mn, Ni and K. The accuracy in the experiments performed ranges from an average of 97% for beryllium to an average of 106% for nickel and is obtained by averaging the percent recovery of a spike of 0.25 ppm, 0.50 ppm and 0.75 ppm for each element. (Jerome - Vanderbilt)
W73-09506

NOTES ON THE DETERMINATION OF MERCURY IN GEOLOGICAL SAMPLES,
Imperial Coll. of Science and Technology, London (England). Dept. of Geology; and Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
M. Koksoy, P. M. D. Bradshaw, and J. S. Tooms.
Institution of Mining and Metallurgy Transactions, London, Vol 76, p B-121-B-124, 1967. 3 fig, 3 tab, 3 ref.

Descriptors: *Mineralogy, *Analytical techniques, *Mercury, *Evaluation, Chemistry, Laboratory tests, Instrumentation, Separation techniques, Sampling, Gases, Water pollution.
Identifiers: *Turkey.

Various aspects of preparation and analysis of naturally occurring materials was conducted during an investigation of the primary and secondary dispersion of mercury from cinnabar and stibnite deposits in Turkey. The instrument used for all analyses was the mercury vapor meter described by James and Webb, with only minor modifications. The data presented demonstrate that to obtain comparable and consistent results it is essential that the time and temperature to which samples are heated be standardized; the samples be ground to very fine powder; the drying of samples be carried out at room temperature; and anomalous and background samples be stored separately or the samples be analyzed after a very limited storage life. (Jerome - Vanderbilt)
W73-09509

SELECTIVE ATOMIC-ABSORPTION DETERMINATION OF INORGANIC MERCURY AND METHYLMERCURY IN UNDIGESTED BIOLOGICAL SAMPLES,
Medical Research Council, Carshalton (England). Toxicology Unit.
L. Magos.
Analyst, Vol 96, p 847-853, December 1971. 3 fig, 2 tab, 10 ref.

Descriptors: *Mercury, *Analytical techniques, *Foods, *Pollutant identification, Spectrophotometry, Laboratory equipment, Path of pollutants, Fish, Fish toxins, Toxicity.
Identifiers: *Atomic absorption spectroscopy, *Methylmercury, Organomercurials, Biological samples.

A simple method for the determination of total mercury in biological samples contaminated with inorganic mercury and methylmercury is described. The method is based on the rapid conversion of organomercurials first into inorganic mercury and then into atomic mercury suitable for aspiration through the gas cell of a mercury vapour concentration meter, by a combined tin (II) chloride-cadmium chloride reagent. It was found that if 100 mg of tin (II) chloride alone were added instead of the tin (II) chloride-cadmium chloride reagent, only the release of inorganic mercury influenced the peak deflection of the potentiometer, thus permitting the selective determination of inorganic mercury in the presence of methylmercury. It was possible first to release inorganic mercury then, after re-acidification of the reaction mixture, methylmercury, by adding the tin (II) chloride-cadmium chloride reagent and sodium hydroxide. When total mercury and inorganic mercury were determined separately, the difference between results gave the methylmercury content of the sample. (Oleszkiewicz-Vanderbilt)
W73-09513

DETERMINATION OF THE COPPER CONCENTRATIONS TOXIC TO MICROORGANISMS,
Moscow State Univ. (USSR). Dept. of Soil Biology.
Z. A. Avakyan, and I. L. Rabotnova.
Trans from Mikrobiologiya, Vol 35, No 5 p 682-687, September 1966. 7 tab, 6 ref.

Descriptors: *Copper, *Toxicity, *Microorganisms, *Metabolism, Biochemistry, Heavy metals, Water pollution, Environmental effects, Nutrients, Phosphorus compounds, Acidity, Chemical reactions.

An investigation to determine the true concentration of copper in solution after the introduction of copper sulfate into various nutrient media and to determine the copper concentration toxic to Torula utilis, was undertaken. It was shown that on media with glycerin, sucrose, or mannitol, copper is contained in solution simultaneously with phosphate only at pH<5.5. Therefore studies of the effects of copper ions can be conducted only with microorganisms that grow well at an acid pH. Heavy metals produce a phosphorus deficiency in the medium. It was found that on T. utilis, the copper ion begins to exert an inhibiting effect at a concentration of 20-30 mg/liter, while at 40 mg/liter growth stops completely. After 50 passages on glycerin medium with copper, the resistance could not be increased. (Jerome - Vanderbilt)
W73-09515

THE LEACHING OF TOXIC STABILIZERS FROM UNPLASTICIZED PVC WATER PIPE: II. A SURVEY OF LEAD LEVELS IN UPVC DISTRIBUTION SYSTEMS,
R. F. Packham.
Water Treat Exam. Vol 20, No 3, p 144-151. 1971.
Identifiers: Chlorides, Distribution, Leaching, *Lead, Pipes, *Polyvinylchloride pipes, *Toxic stabilizers, United-Kingdom, Water analysis.

Water samples were collected from many uPVC (unplasticized polyvinylchloride) distribution systems in the United Kingdom and analyzed for Pb. Pb was also determined where no uPVC contact had taken place. Pb concentrations sampled were generally very low, usually identical to content prior to contact with uPVC. The use of stabilizers in uPVC pipe does not seem to constitute a health hazard to domestic water consumers.--Copyright 1973, Biological Abstracts, Inc.
W73-09521

A ROTARY SYSTEM FOR CALIBRATING FLOWMETERS USED FOR PLANKTON SAMPLING,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 07B.
W73-09523

VITAL STAINING TO SORT DEAD AND LIVE COPEPODS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 07B.
W73-09539

A NEW METHOD FOR THE GAS CHROMATOGRAPHIC SEPARATION AND DETECTION OF DIALKYLMERCURY COMPOUNDS-APPLICATION TO RIVER WATER ANALYSIS,
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
R. C. Dressman.
J Chromatogr Sci. Vol 10, No 7, p 472-475. 1972. Illus.
Identifiers: Pollution detection, *Chromatography, Gas, *Mercury compounds, Rivers, Separation techniques, Water analysis.

A method of selectively analyzing for dialkylmercury compounds at the ng level without converting these compounds to their chloride salts for electron capture detection was developed. An homologous series of 4 dialkylmercury compounds beginning with dimethylmercury was successfully separated using a 6 ft x 2 mm, i.d. (internal diameter), glass column packed with 5% DC-200 + 3% QFI (copacked) on Gas Chrom Q (80/100 mesh). The separation was accomplished by programming the column oven temperature from 70 deg C, after a 2 min hold, to 180 deg C at a rate of 20 deg C/min. The separated compounds were combusted in an FID (flame ionization detector) and the resultant free Hg was passed into a cold vapor Hg detector. Practical absolute sensitivity for Hg was 0.1 ng using a Colman Mercury Analyzer MAS-50. This combined separation and detection technique provides a unique, specific and highly sensitive method of direct identification of dialkylmercury compounds.--Copyright 1973, Biological Abstracts, Inc.
W73-09584

AN EVALUATION OF APHA METHOD FOR DETERMINING ARSENIC IN WATER,
Environmental Health Lab., McClellan AFB, Calif.
E. G. Robles, Jr.
Available from NTIS, Springfield, Va 22151 AD-752 526, Price $3.00 printed copy; $0.95 microfiche. Air Force Environmental Health Laboratory Professional Report No 70M-8, March 1970. 19 p, 2 fig, 1 tab, 7 ref, 6 append.

Descriptors: *Water quality, *Chemical analysis, *Arsenic radioisotopes, *Water supply, *Military reservations, California, Analytical techniques, Pollutant identification, X-ray florescence, Spectroscopy, Neutron activitation analysis.
Identifiers: *Edwards Air Force Base (Calif), *Arsenic.

Since April 1968, the presence of arsenic in the water supply at Edwards AFB, California, has been under study. Hundreds of samples have been examined from the various wells and at points in the distribution system for arsenic, with continuing positive results. The quantity of arsenic present is not a matter for undue concern in any of the wells, except possibly well No. 4, which exceeds the USPHS limit. This report describes additional analyses of arsenic in water from well No. 4. A large sample of water from well No. 4 was subjected to an exhaustive analysis to determine if arsenic was present or if interferences caused the APHA 'Standard Methods' procedure to yield erroneous results. The results of analyses performed by various methods including x-ray fluorescence, emission spectroscopy, and atomic absorption show that arsenic was present in the concentration range (about 0.16 mg/liter) reported using the standard APHA method. (Woodard-USGS)
W73-09593

EVALUATION OF MEASUREMENT METHODS AND INSTRUMENTATION FOR ODOROUS COMPOUNDS IN STATIONARY SOURCES. VOLUME 1---STATE OF THE ART,
Esso Research and Engineering Co., Linden, N.J. Government Research Div.
H. J. Hall, and R. H. Salvesen.
Available from NTIS Springfield, Va 22151 PB-212 812 Price $3.00 printed copy; 95 cents microfiche. Environmental Protection Agency Report, July 1972. 92 p, 6 fig, 7 tab, 147 ref. EPA 68-02-0219.

Descriptors: *Air pollution, *Odor, *Water pollution sources, *Pollutant identification, Industrial plants, Sulfer compounds, Data collections, Chemical analysis, Instrumentation, Waste disposal, Fallout, Oil industry, Air pollution effects.
Identifiers: *Air pollution control, Odorants, Rendering plants.

A state-of-the-art review was made to collect and evaluate information on the instrumentation available to measure the quantities of specific odorants in industrial plant emissions. It object is to examine the possibility of substituting a quantitative measurement of odorants for the subjective measurement of odors as a guide for the control of odorous emissions. The review presents background information for the basic definitions of the problem of odorant emissions measurements and the types of instrumentation available. Details are given for three industries considered as odorant sources. Information is presented on specific instruments which are commercially preferred. (Woodard-USGS)
W73-09601

DIATOMS FOUND IN A BOTTOM SEDIMENT SAMPLE FROM A SMALL DEEP LAKE ON THE NORTHERN SLOPE, ALASKA,
For primary bibliographic entry see Field 05C.
W73-09622

ANALYTICAL METHODS FOR RUTHENIUM--106 IN MARINE SAMPLES,
Institute of Public Health, Tokyo (Japan). Dept. of Radiological Health.
K. Iwashima.
Journal of Radiation Research, Vol 13, No 3, p 127-148, September 1972. 2 fig, 10 tab, 51 ref.

Descriptors: *Radioisotopes, *Sea water, *Suspended solids, Marine plants, Marine animals, *Analytical techniques, *Chemical analysis, Radioactivity, Bottom sediments, Environmental effects, Pollutant identification.
Identifiers: *Ruthenium-106.

Various methods for analyzing ruthenium-106 in marine samples are presented. Ways of treating suspended materials in sea water preserving water samples and procedures for extracting ruthenium completely from organisms and sediments are discussed in detail. In this study marine organisms and sediments were ashed at 400-500 deg C and then fused with a mixture of potassium hydroxide and potassium nitrate. Ruthenium was extracted with carbon tetrachloride as ruthenium tetroxide, and then back-extracted with sodium hydroxide solution containing a reducing agent. The loss of ruthenium throughout ashing and chemical procedures was found to be negligible. Data concerning chemical and radiochemical yields, sensitivity, and contamination factors in the analyses are included. Optimum methods for radiochemical analysis of shellfish and seaweed, bottom sediments, and sea water are described step-by-step. (Ensign-PAI)
W73-09648

ENVIRONMENTAL ASPECTS OF DREDGING IN ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 05C.
W73-09651

5B. Sources of Pollution

WATER QUALITY AS RELATED TO POSSIBLE HEAVY METAL ADDITIONS IN SURFACE AND GROUNDWATER IN THE SPRINGFIELD AND JOPLIN AREAS, MISSOURI,
Missouri Water Resources Research Center, Rolla.
For primary bibliographic entry see Field 05A.
W73-09104

CIRCULATION PATTERNS IN LAKE SUPERIOR,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering; and Wisconsin Univ., Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 02H.
W73-09106

PROCEEDINGS OF CONFERENCE ON TOWARD A STATEWIDE GROUNDWATER QUALITY SUBCOMMITTEE CITIZENS ADVISORY COMMITTEE, GOVERNORS ENVIRONMENTAL QUALITY COUNCIL.

Available from the National Technical Information Service as PB-220 390, $3.00 in paper copy, $0.95 in microfiche. University of Minnesota, Water Resources Research Center, St. Paul, Mimeographed Rept., February 1973. 238 p. OWRR A-999-MINN (27) 14-31-0001-3823.

Descriptors: *Groundwater, *Water quality, *Information exchange, *Hydrogeology, Water pollution, Solid wastes, Waste disposal, Agricultural runoff, *Minnesota.
Identifiers: *Hydrogeologic framework, *Reactive system, *Transport system.

The objectives of the Conference on Toward A Statewide Groundwater Quality Information System were: to document, publicize, and promote the need for a statewide groundwater quality information system; to consider possible institutional arrangements for designing the system; and to review the factors to be considered in designing the system. The following topics were discussed: the natural quality of groundwater in Minnesota, the use of groundwater in Minnesota, hydrogeologic framework for deterioration in groundwater quality, groundwater pollution problems in Minnesota, establishing the impact of agricultural practices on groundwater quality, spray disposal of sewage effluent, solid waste disposal, needs and uses for a groundwater quality data system, water well records and information system needs, subsurface geologic information system in Minnesota, groundwater quality information system experiences in other states, Federal water information systems, and relation of groundwater quality information system and other systems in Minnesota. (Walton-Minnesota)
W73-09113

MATHEMATICAL MODEL FOR SCREENING STORM WATER CONTROL ALTERNATIVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
P. H. Kirshen, D. H. Marks, and J. C. Schaake, Jr.
Available from the National Technical Information Service as PB-220 353, $3.00 in paper copy, $0.95 in microfiche. Partial Completion Report 157, October 1972. 125 p, 10 fig, 9 tab, 47 ref. OWRR C-2137 (3403) (4).

Descriptors: *Storm water, Urban runoff, Urban hydrology, *Waste storage, Detention, *Combined sewers, Drainage systems, Linear programming, *Mathematical models, *Waste water disposal, *Ohio, Simulation analysis.
Identifiers: Screening models, *Cincinnati (Ohio).

The general problem of pollution from combined sewer systems is discussed and control alternatives are described. A linear programming model for screening the sizes and operating policies of storage tanks, pipes, and treatment plants is formulated. The thesis also discusses a storm water simulation model and shows how it can be used interactively with the screening model to plan for the control of combined sewer overflow and local flooding in the Bloody Run Drainage Basin, Cincinnati, Ohio. The results of this case study indicate that the screening model and the planning method are reliable.
W73-09119

EXPERIMENTAL STUDY OF UNDERGROUND SEEPAGE TOWARD WELLS,
Rhode Island Univ., Kingston. Dept of Engineering.
C-F. Tsai.
M Sc Thesis, 1972. 38 p. 15 fig, 2 tab, 20 ref.

Descriptors: *Groundwater movement, *Mathematical models, *Path of pollutants, *Hydraulic models, Soil disposal fields, Water wells, Hydrogeology, Septic tanks, Seepage, Drawdown.

A mathematical solution for groundwater flow problems was studied experimentally using a test model of 8 feet in diameter and 6 feet in height. The mathematical solution agreed satisfactorily with the measured data. The mathematical solution was then used to establish relationships among such parameters as the rate of seepage from an infiltration area to a well and distance between the infiltration area and the well for various hydraulic boundary conditions. The relationships are helpful for determination of a safe distance between a water supply and a waste disposal field provided that the properties of pathogenic substances in the waste are known. (Knapp-USGS)
W73-09131

DREDGE SPOIL DISPOSAL IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Dept. of Oceanography; and Rhode Island Univ., Kingston. Dept. of Zoology.
For primary bibliographic entry see Field 05E.
W73-09142

HYDROGRAPHIC OBSERVATIONS IN ELKHORN SLOUGH AND MOSS LANDING HARBOR, CALIFORNIA, OCTOBER 1970 TO NOVEMBER 1971,
Moss Landing Marine Labs., Calif.
W. W. Broenkow, and R. E. Smith.
Available from NTIS, Springfield, Va 22151 COM-72 11273 Price $3.00 printed copy; $0.95 cents microfiche. Technical Publication 72-3, July 1972. 74 p, 1 fig, 66 tab, 10 ref. NOAA Grant No 2-35137.

Descriptors: *Water quality, *Chemical analysis, *Harbors, *Estuaries, *California, Basic data collections, Water analysis, Water chemistry, Sampling, Boats, Water pollution sources, Path of pollutants, Water resources development, Planning, Environmental effects, Dredging.
Identifiers: *Elkhorn Slough (Calif), *Moss Landing Harbor (Calif), Deepwater port planning.

In Ocotber 1970, Moss Landing Marine Laboratories began an observational program to determine the seasonal changes in the water chemistry of Elkhorn Slough and Moss Landing Harbor, California. This report contains the first year of data (October 1970 to November 1971). These data are of immediate interest in determining the flushing and mixing mechanisms of the slough and in establishing the effect that local domestic and industrial effluents have on the distribution of chemical parameters. In recent years, various plans have been suggested for the further development of Elkhorn Slough ranging from the construction of a deepwater port to the development of commercial shellfish production. Data in this report should aid those agencies ultimately responsible for the development of the area. Samples were taken simultaneously from two outboard motor boats, one for Elkhorn Slough at five stations and one for four Harbor stations. The parameters measured were water temperature, salinity, dissolved oxygen, and nutrient ions. (Woodard-USGS)
W73-09162

SOME MECHANISMS OF OCEANIC MIXING REVEALED IN AERIAL PHOTOGRAPHS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 07B.
W73-09168

WORLDWIDE SULFUR POLLUTION OF RIVERS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
R. A. Berner.
Journal of Geophysical Research, Vol 76, No 27, p 6597-6600, September 20, 1971. 3 tab, 13 ref. NSF GA-1441.

Descriptors: *Sulfur, *Water pollution sources, *Rivers, Path of pollutants, Sulfates, Weathering, Industrial wastes, Acid mine water.

The amount of sulfur that has been contributed to the world average of river water from different sources is estimated. From two independent calculations the contribution due to pollution is estimated to be 27% and 28% although both are probable minimum values. Other sources are weathering of sedimentary rocks, 35%; volcanic emanations and hot springs, 7%; and cyclic sulfur carried inland from the oceans, 30%. (Knapp-USGS)
W73-09169

WISCONSIN LAKES RECEIVING SEWAGE EFFLUENTS,
Wisconsin Univ., Madison. Water Resources Center.
J. P. Wall, P. D. Uttormark, and M. J. Ketelle.
Technical Report WIS-WRC 73-1. January 1973. 26 p. EPA R-801363.

Descriptors: *Water pollution sources, *Wisconsin, *Lakes, *Sewage effluents, Eutrophication, Nutrients, Phosphorus, Nutrient removal, Industrial wastes, Urban runoff, Agricultural runoff, River basins, Basins.

Presumably some Wisconsin lakes could be improved if nutrient contributions from wastewater sources were eliminated or substantially reduced, thus as the first step, the lakes which receive sewage effluent discharges are listed. The drainage basin surveys and pollution investigation reports, conducted comprehensively for over twenty years and published by the Wisconsin Department of Natural Resources, furnished the data and material on which this presentation is based. Data exist concerning sewage treatment plants, whereas information about industrial effluent or urban runoff or agricultural drainage is scanty. The sources of discharge are identified in each watershed with accompanying descriptions of the type of treatment, quantity of output, quality of effluent, and recommendations for improvement where appropriate. The receiving stream is named and associated chemical and biological data are presented as available. The lakes fed by these streams have been identified and pertinent data presented. Somewhat greater emphasis is given to those lakes with surface areas of 100 acres or greater, but smaller lakes and ponds receiving effluent are identified as encountered. Nine of the lakes named are among the fifteen largest bodies of water in the state. (Jones-Wisconsin)
W73-09176

ATMOSPHERIC CONTRIBUTIONS OF NITROGEN AND PHOSPHORUS,
Wisconsin Univ., Madison. Water Resources Center.
J. D. Chapin, and P. D. Uttormark.
Technical Report WIS-WRC 73-2, February 1973. 35 p. EPA R-801343.

Descriptors: *Atmosphere, *Nitrogen, *Phosphorus, Reviews, Water quality, Lakes, Eutrophication, Nutrients, Precipitation (Atmospheric), Rainfall, Snowfall, Fallout, United States, Geographical regions, Land use, Seasonal, Birds, Dusts, Soil erosion, Industries, Smoke, Ammonia, Nitrates, Seeds, Pollen, Bibliographies, Water pollution sources.
Identifiers: Dry fallout.

Estimates are presented, compiled from a literature review, of atmospheric contributions of nitrogen and phosphorus via bulk precipitation, which includes rainfall, snowfall, and dry fallout. Data are converted to kg/ha/yr, and, to a large extent, are site specific. The contribution of phosphorus via bulk precipitation has been studied less intensively than nitrogen because other sources of phosphorus are likely to be more important. Nitrogen contribution by precipitation are mapped for the United States. Although considerable differences are noted between findings of various investigators, it is generally agreed that storms and prevailing winds off the ocean are low in phosphorus content and that the major source of phosphorus in rainfall is from dust generated over the land. Urbanization and industrialization, soil erosion, industrial ash, and smoke are commonly listed. Data interpretation is hampered by the failure of authors to specify the form of nitrogen and phosphorus measured or the analytical procedure used. Atmospheric contributions of nitrogen and phosphorus appear more significant than is generally recognized with respect to control of lake eutrophication and they are likely to be larger in the future. (Jones--Wisconsin)
W73-09177

MICROBIOLOGICAL SEA WATER CONTAMINATION ALONG THE BELGIAN COAST, I - GEOGRAPHICAL CONSIDERATIONS,
Belgian Army Military Hospital, Ostend. Lab. for Sea Microbiology.
J. Pinon, J. Pijck, and C. Van Cauwenberghe.
Revue Internationale d'Oceanographie Medicale, Nice, Vol 27, p 5-15, 1972. 2 fig, 5 ref.

Descriptors: *Coasts, *Water pollution sources, *Microorganisms, Sedimentation, Sands, Sand bars, *Tides, *Currents (Water), Wind, Temperature, Density, Irradiation, Turbidity, Human population, Seasonal.
Identifiers: *Belgian Coast, *North Sea.

The area under study on the Belgian Coast is homogeneous and 65 km long. The southern part of the North Sea is usually less than 50 m deep with a bottom of fine sand and has sand banks parallel to the coast. Size and direction of the tides and tidal currents are described along with the dominating wind direction. Water temperature, density, sun irradation, coastal populations at the varying seasons, water turbidity and evacuation points are presented as background to the microbial contamination study. (See also W73-09204) (Ensign-PAI)
W73-09203

MICROBIOLOGICAL SEA WATER CONTAMINATION ALONG THE BELGIAN COAST, II - TECHNIQUES - NORMS - PRELIMINARY RESULTS,
Belgian Army Military Hospital, Ostend. Lab. for Sea Microbiology.
J. Pinon, and J. Pijck.
Revue Internationale d'Oceanographie Medicale, Nice, Vol 27, p 17-40, 1972. 7 fig, 4 tab, 16 ref.

Descriptors: *Coasts, Water pollution sources, Data collections, *Bioindicators, *Bacteria, Microorganisms, *Coliforms, Sampling, Cultures, Human population, Temperature, Currents, Sites, Time, Data processing.
Identifiers: *Belgian Coast, *North Sea.

A statistical investigation on the pollution indicator-organisms was carried out for a better understanding of, and the prediction of fluctuations of microbial pollution along the Belgian coasts. A mean fecal coliform concentration greater than 10/ml is considered dangerous. For bacterial counting, under experimental conditions, the standard error for the 'total microbes, 37 degrees C' f.i. is approximately 20%. Technical details on sampling, culture and counting are given. Indicator-organisms, chosen were the group of organisms growing on a rich medium at 37 degrees C, the total coliforms and the fecal coliforms. Nine points of observation were chosen along the coast, one identical to one of the nine pollution source points. Data on the 20 parameters gathered are processed by a computer. (See also W73-09203) (Ensign-PAI)
W73-09204

T-90, CRITERION OR CHIMAERA,
Aarhus Univ. (Denmark). Inst. of Hygiene.
G. J. Bonde.
Revue Internationale d'Oceanographie Medicale, Nice, Vol 25, p 5-15, 1972. 2 fig, 1 tab, 8 ref, 1 append.

Descriptors: *Bacteria, *Degradation (Decomposition), Planning, Sewage disposal, *Outlets, Tracers, Radioisotopes, *Bioindicators, *E. coli, Mathematical studies, Salinity, Dilution, Sedimentation, Mortality.
Identifiers: *T-90, *Bacterial decay.

Estimating bacterial decay is a serious problem in both field and laboratory experiments. The determination of T-90 (the time necessary for a 90% decrease in numbers) by field experiments was used as an aid in planning sewage outlet sites. The T-90 estimates are sometimes computationally difficult being situated in the asymptotic region of the reduction curve. A computation based on the dose-response relationship and a transformation to probits is advocated along with an estimation of T-

50 which is a more reliable measure. Examples of E. coli counts in the waters of the straits between the Baltic Sea and the Kattegat are presented. With this method extrapolation to the point of total bacterial disappearance is possible. Data from waters of higher salinity indicate that dilution and sedimentation are the dominant factors, bacterial die-away being negligible in cold climates. (Ensign-PAI)
W73-09207

DISTRIBUTION OF POLYCHAETA IN POLLUTED WATERS,
Modena Univ. (Italy). Inst. of Zoology.
G. Cognetti.
Revue Internationale d'Oceanographie Medicale, Nice, Vol 25, p 23-34, 1972. 5 tab, 8 ref.

Descriptors: *Harbors, Water pollution effects, *Annelids, Distribution patterns, Animal physiology, Growth rates, *Path of pollutants.
Identifiers: *Leghorn Harbour, *Polychaetes, *Italy.

Chemico-physical analysis was made of the waters of Leghorn Harbour from the peripheral water of the outer harbor to the docks themselves. The distribution of polychaetes changes with the change in habitat as it is affected by the various degrees of pollution. Where there is little pollution there is a great increase in the number of individuals of certain species, while others disappear completely. The morphological and size differences in the individuals in the more polluted waters is also discussed. (Ensign-PAI)
W73-09208

UTILIZATION OF CARD-FLOATS FOR THE STUDY OF SURFACE DRIFT AND APPLICATION IN THE PREVENTION OF COASTAL POLLUTION (UTILISATION DE CARTES-FLOTTEURS POUR L'ETUDE DES DERIVES DE SURFACE ET APPLICATION A LA PREVISION DES P OLLUTIONS CATIERES),
Service Hydrographique de la Marine, Paris (France).
J. N. Pasquay, and J. Bonnot.
Houille Blanche, Vol 26, No 8, p 769-778, 1971. 7 fig.

Descriptors: *Coasts, Pollutants, *Distribution patterns, *Drifting (Aquatic), *Currents (Water), Surveys, Surveying instruments, Path of pollutants.
Identifiers: *French coast, *Drift cards.

The Hydrographic Service of the French Navy is conducting card float surveys. Cards released and recovered are recorded on magnetic tape. Approximately 18,000 cards have been received so far. These cards are indicative of the areas of the French coast which are apt to be affected by pollution incidents at sea. The drift of these cards was studied under different wind conditions so that a permanent current pattern for predicting pollutant drift on the surface could be established. (Ensign-PAI)
W73-09210

PERSPECTIVES OF USE OF LUMINESCENT METHODS FOR RESEARCH OF THE POLLUTION PROCESS IN THE SEA (PERSPEKTIVEN DER ANWENDUNG VON LUMINESZENS--METHODEN ZUR UNTERSUCHUNG DER AUSBREITUNGS-PROZESSE VON BEIMENGUNG IM MEER),
For primary bibliographic entry see Field 05A.
W73-09211

STUDIES OF MIXING AND THINNING PROCESSES OF POLLUTION IN SEWAGE DISCHARGE AREAS IN THE SEA THROUGH THE USE OF FLUORESCENT INDICATORS (UNTERSUCHUNG DER VERMISCHUNGS- UND VERDUNNUNGSPROZESSE VON VERUNREINIGUNGEN IN ABWA SSEREINLEITUNGSGEBIETEN IM MEER MIT HILFE FLUORESZIERENDER INDIKATOREN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. I. Zac, and M. S. Nemirovskij.
Beitrage zur Meereskunde, No 30-31, p 163-172, 1972. 3 fig, 1 tab, 7 ref.

Descriptors: Coasts, *Sewage, *Outlets, Diffusion, *Waste dilution, *Mixing, *Fluorescent dye, Fluorometry, Path of pollutants.
Identifiers: *USSR, *Crimean Coast, Uranin, Vertical dilution, Horizontal dilution.

Measurements of diffusion intensity, mixing, and dilution of sewage in the Crimean coastal waters were taken with fluorescent indicators. Special fluorometer, light filter, and rheostat were used for calculations near sewage outfalls. Uranin was introduced into the sewers along the coast and dye concentrations were measured at various depths and distances along the jet. At deep-lying sewage outfall sites, vertical dilution was 10-100 times higher than horizontal dilution. (Ensign-PAI)
W73-09212

THE POLLUTION OF THE COASTS AND EFFLUENTS IN THE SEA (LA POLLUTION DES COTES ET LES REJETS EN MER),
For primary bibliographic entry see Field 05G.
W73-09215

A TRACER SIMULATION OF WASTE TRANSPORT IN THE MUDDY CREEK-RHODE RIVER ESTUARY, MARYLAND,
Geological Survey, Washington, D.C. Water Resources Div.
N. Yotsukura, R. L. Cory, and K. Murakami.
Chesapeake Science, Vol 13, No 2, p 101-109, June 1972. 6 fig, 1 tab, 7 ref.

Descriptors: *Estuaries, *Discharge, *Sewage effluents, *Dye releases, Rhodamine, Dye concentrations, *Path of pollutants, Water pollution, Treatment facilities, *Maryland.
Identifiers: *Muddy Creek (Md), *Rhodamine WT dye.

A dye injection study was conducted in the Muddy Creek estuary, Maryland to determine the effects of discharge from a proposed sewage treatment plant. Rhodamine WT dye was injected near the head of the estuary and concentration of the dispersed dye was periodically measured at a number of fixed sampling stations downstream. The principle of superposition in a linear system was used in the extimation of dye concentration buildup in the study area. The results of the study suggest that the water of the north fork of the estuary would be contaminated as much as the south fork, even if the effluent site were located on the south fork. (Ensign-PAI)
W73-09217

ANTIBIOTIC-RESISTANT COLIFORMS IN FRESH AND SALT WATER,
Alabama Univ., Birmingham. Medical Center.
T. W. Feary, A. B. Sturtevant, Jr., and J. Lankford.
Archives of Environmental Health, Vol 25, No 3, p 215-220, September 1972. 1 fig, 4 tab, 12 ref.

Descriptors: *Bacteria, *Coliforms, *Antibiotics, *Public health, Water sampling, Water pollution effects, *Enteric bacteria, *Alabama.
Identifiers: R factors, *Infectious drug resistance, *Mobile Bay, *Tombigbee River system (Ala).

Infectious drug resistance, mediated by episomal elements (R factors), is an important factor in the spread of multiple resistance among enteric bacteria. Results of a study of the incidence of R factors among antibiotic-resistant coliforms isolated from the Black-Warrior-Tombigbee River system and Mobile Bay, are presented. Surface water samples were collected from 20 sites on the river system and 16 sites within the Bay. Antibiotic-resistant coliforms were detected in nearly all of River samples and in about 50% of the bay samples. Of the 194 strains tested, 20% contained demonstrable R factors; the majority of the R factors conferred resistance to two or more antibiotics and in addition, 53% conferred resistance to three or more antibiotics. Potential health hazardous to man and domestic animals are discussed. (Ensign-PAI)
W73-09218

INCREASING ORGANIC POLLUTION IN KINGSTON HARBOUR, JAMAICA,
University of the West Indies, Kingston (Jamaica). Dept. of Zoology.
B. A. Wade, L. Antonio, and R. Mahon.
Marine Pollution Bulletin, Vol 3, No 7, p 106-110, July 1972. 4 fig, 5 tab, 5 ref.

Descriptors: Harbors, Organic compounds, *Nutrients, *Bioindicators, Water pollution sources, Sewage, Industrial wastes, Runoff, Environmental effects.
Identifiers: *Kingston Harbor, *Jamaica, *Spiochaetopterus oculatus, *Capitella capitata.

The current status of Kingston Harbor, Jamaica, with respect to pollution, is reported. The harbor is a major deep water port and serves as a center for transportation, trade and commerce. It also serves as a receptacle for large volumes of primary treated domestic sewage, raw industrial wastes and agricultural wastes. The natural freshwater runoff of river and gully courses is a major source of high organic and nutrient input into the harbor. Two known indicators of high organic pollution, Spiochaetopterus oculatus and Capitella capitata, are present in increasing numbers in Kingston Harbor. The study concludes that if the present rate of environmental deterioration is allowed to continue unchecked complete destruction of the benthic fauna over most of the harbor may be imminent. (Ensign-PAI)
W73-09219

OIL POLLUTION OF THE SEA,
N. Pilpel.
Ecologist, Vol 2, No 3, 3 p, March 1972. 1 fig.

Descriptors: *Oil pollution, *Oceans, *Bacteria, Water pollution sources, Laboratory tests, On-site investigations, Dispersion.
Identifiers: *Oil dispersion processes, *Decomposition.

The nature and scope of oil pollution at sea is reviewed. Certain natural processes which help disperse spilled oil are discussed, along with activities which prolong the existence of oil. Research on oxidation and bacterial decomposition is summarized. Preliminary results from lab experiments indicate that many species of bacteria are capable of utilizing crude oil as a source of food and energy. Field work done at sea on the processes involved in the decomposition of oil is also discussed. The question of whether or not man can continue to rely on natural sources to clean up the oceans he pollutes remains unanswered; indications are, though, that he cannot. (Ensign-PAI)
W73-09222

AN EXPERIMENTAL EVALUATION OF OIL SLICK MOVEMENT CAUSED BY WAVES,
Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
D. J. Alofs, and R. L. Reisbig.

Journal of Physical Oceanography, Vol 2, No 4, p 439-443, October 1972. 6 fig, 1 tab, 11 ref. USCG DOT-CG11219G-A.

Descriptors: *Oil spills, *Waves, *Laboratory tests, Surface waters, Aquatic drift, Floats, Forecasting, Water pollution sources, *Path of pollutants, Stokes law.
Identifiers: *Oil spill movement, Surface drift velocities.

The influence of waves on the direction of a oil spill movement was studied experimentally using mechanically generated gravity waves in a water tank. Results of the experiment showed that the measured surface drift velocities were in all cases higher than those predicted by the Stokes theory of deep water waves. It was also concluded that drift velocity is insensitive to float size when the float length is larger than one wavelength. Thin plastic floats were found to have the same drift speed as similarly sized oil lenses. Possible adaptation of this experimental data to predict oil spill movement in the open ocean is discussed. (Ensign-PAI)
W73-09233

MERCURY IN THE NETHERLANDS ENVIRONMENT, (KWIK IN HET NEDERLANDSE MILIEU (SLOT)),
J. E. Carriere.
Water, Vol 56, No 1, p 18-21, January 1972.

Descriptors: *Mercury, Water pollution sources, Coasts, *Fish, Rivers, Runoff, Environment.
Identifiers: *Netherlands Coast, *Rhine River, *Seals.

Investigations of the mercury content in fresh and salt water fish and in the coastal waters of the Netherlands were conducted. The mercury content in fish was between 0.01 and 0.1 ppm. Seals were found to have the highest mercury content. The northern and southern areas of the Netherlands coast showed higher concentrations of mercury than other areas. Thus contamination was thought to be related to this element being carried by the Rhine into the littoral. (Ensign-PAI)
W73-09237

ARSENIC INTOXICATION FROM WELL WATER IN THE UNITED STATES,
Minnesota Dept. of Health, Minneapolis.
E. J. Feinglass.
The New England Journal of Medicine, Vol 288, No 16, April 19, 1973, p 828-830. 1 tab, 11 ref.

Descriptors: Wells, *Water wells, *Arsenicals (Pesticides), Arsenic compounds, Toxins, Toxicity, Water pollution, Shallow wells, Poisons, Pesticides, *Pesticide toxicity, Cores, Minnesota.
Identifiers: Gastrointestinal illness, *Arsenic intoxication.

In 11 cases reported from a small town in western Minnesota, acute and subacute arsenic intoxication was related to ingestion of well water. In May, 1972, a local building contractor expanded his facilities by building a warehouse and office structure on the outskirts of the town. A well was driven, water from which was used by 13 people working on the premises. During the next 2 1/2 months, eleven of the thirteen persons reported positive symptoms of arsenic poisoning. Specimens from the well water in question contained 21,000 and 11,800 ppb arsenic (maximum allowable in the U.S. is 50 ppb). In the course of interviews with area residents, it was learned that grasshopper bait composed of arsenic, bran, and sawdust had been kept on the ground on property now owned by the contractor. Although there were no records of these events, it was believed that the bait was buried in that area. Burial of arsenical material results in high concentrations of the substance in a circumscribed area. Contamination of wells dug directly through such areas is not surprising; although the likelihood of repetitions of these events is remote, the importance of throughtful planning in the disposition of potentially toxic material must be stressed. (Campbell-NWWA)
W73-09248

INFANTILE METHEMOGLOBINEMIA CAUSED BY CARROT JUICE,
Saint Louis Children's Hospital, Mo.
For primary bibliographic entry see Field 05C.
W73-09249

BIOLOGICAL ANALYSIS OF WATER AND WASTEWATER.
Millipore Corp., Bedford, Mass.
For primary bibliographic entry see Field 05A.
W73-09254

LIMITATIONS TO LENGTH OF CONTAINED OIL SLICKS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
D. L. Wilkinson.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 99, No HY5, Paper 9711, p 701-712, May 1973. 9 fig, 2 ref, append.

Descriptors: *Oily water, *Oil spills, *Oil-water interfaces, *Water pollution treatment, *Hydraulics, Path of pollutants, Stratified flow, Froude number, Waves (Water).

The drag forces exerted by a current passing beneath a contained oil slick cause it to thicken in the direction of flow. In rivers and channels of finite depth this process cannot continue indefinitely; ultimately, if the slick is of sufficient length an instability develops at the oil-water interface, making the retention of more oil impossible. The ultimate or critical length, the volume, and the profile of a contained oil slick may be expressed as a nondimensional function of the Froude number of the river flow and the interfacial and boundary friction coefficients. Laboratory experiments verify the dynamics of the theoretical model and enable magnitudes of the interfacial friction coefficient to be calculated. The interfacial stress is markedly increased if waves develop at the interface. (Knapp-USGS)
W73-09270

PREDICTION OF WATER QUALITY IN STRATIFIED RESERVOIRS,
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.
M. Markofsky, and D. R. F. Harleman.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 99, No HY5, Paper 9730, p 729-745, May 1973. 7 fig, 1 tab, 10 ref, append.

Descriptors: *Water quality, *Reservoirs, *Stratified flow, *Thermal stratification, *Mathematical models, Numerical analysis, Forecasting, Dissolved oxygen, Withdrawal, Water temperature.
Identifiers: *Water quality forecasting.

A transient mathematical model which couples the conservation of heat and mass equations was developed and solved numerically. Vertical temperature and concentration profiles, outlet temperature, and concentrations for conservative and nonconservative substances may be obtained. The results of the predictive model were compared to laboratory measurements of a conservative dye tracer and to field measurements of dissolved oxygen in the Fontana Reservoir during 1 yr of operation. The trends shown for dissolved oxygen as a function of time were satisfactorily reproduced. (Knapp-USGS)
W73-09272

RUNOFF AND SOIL LOSSES ON HAGERSTOWN SILTY CLAY LOAM: EFFECT OF HERBICIDE TREATMENT,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 02J.
W73-09279

EXCHANGE PROCESSES IN SHALLOW ESTUARIES,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 02L.
W73-09283

MICROBIOLOGICAL ASPECTS OF GROUND--WATER RECHARGE--INJECTION OF PURIFIED UNCHLORINATED SEWAGE EFFLUENT AT BAY PARK, LONG ISLAND, NEW YORK,
Geological Survey, Menlo Park, Calif.
G. G. Ehrlich, T. A. Ehlke, and J. Vecchioli.
Journal of Research of the U S Geological Survey, Vol 1, No 3, p 341-344, May-June 1973. 2 fig, 5 tab, 9 ref.

Descriptors: *Waste disposal wells, *Clogging, *Well screens, *Bacteria, *Slime, Reclaimed water, Water reuse, Chlorination, Sewage, Tertiary treatment, New York.
Identifiers: *Long Island (NY).

Unchlorinated, tertiary-treated sewage effluent was injected through a well at Bay Park, Long Island, N.Y., into a sand aquifer at a rate of 340 gpm for 10 days. Massive, biologically produced slime deposits formed in the filter pack immediately adjacent to the well screen. Observed head buildup in the recharge well was correlated with the formation of these deposits. Comparison of results from this test with results of earlier tests suggests that formation of these deposits may be avoided by addition of chlorine to the injectant. (Knapp-USGS)
W73-09292

DENITRIFICATION. STUDIES WITH LABORATORY-SCALE CONTINUOUS-FLOW UNITS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 05D.
W73-09304

CORRELATION TO EVALUATE THE EFFECTS OF WASTE WATER PHOSPHORUS ON RECEIVING WATERS,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05C.
W73-09306

HYDROGEN PEROXIDE AIDS IN MEASURING SLUDGE OXYGEN UPTAKE RATES,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. C. Young, and E. R. Baumann.
Water Pollution Control Federation Highlights, Vol 10, No 1, p 4-5, January 1973. 1 fig, 3 ref.

Descriptors: *Dissolved oxygen, *Activated sludge, *Measurement, *Methodology, Biochemical oxygen demand, Sewage bacteria, Aquatic microorganisms, Sewage sludge.
Identifiers: *Hydrogen peroxide, *Absorption rates, Volatile suspended solids, Total suspended solids.

The use of hydrogen peroxide to increase DO in sludge samples allows for more meaningful measurements of oxygen uptake rates. Activated sludge mixed liquor samples were collected from an operating plant. Two to three drops of 10 percent H2O2 were added to samples placed in 300-ml BOD bottles. A calibrated DO probe was im-

mediately inserted into the bottle and sealed. The DO indicated by the probe was allowed to decrease to about 8 to 10 mg/l before measurements were recorded. This was done so that the DO reading would be in the range used to calibrate the probe. This is also approximately the range of DO's to which the organisms normally would be accustomed. Also, the DO probe would stabilize during this initial period. Straight-line changes in DO were measured in all cases. The slope of the DO versus time line represents the rate of uptake of oxygen by the microorganisms in the sample. In all cases, the straight-line relationship extended to below 0.5 mg/l. This test procedure requires less time for analysis than does the measure of total and volatile suspended solids. It is simple, and the amount of hydrogen peroxide added is not extremely critical, so that the sources of error are minimized. Applications of this test are discussed. (Holoman-Battelle)
W73-09308

THALASSIOSIRA ECCENTRICA (EHRENB.) CLEVE, T. SYMMETRICA SP. NOV., AND SOME RELATED CENTRIC DIATOMS,
Texas A and M Univ., College Station. Dept. of Oceanography.
G. A. Fryxell, and G. R. Hasle.
Journal of Phycology, Vol 8, No 4, p 297-317, December 1972. 46 fig, 3 tab, 34 ref.

Descriptors: *Marine algae, *Diatoms, *Systematics, Ecological distribution, *Phytoplankton, Chrysophyta, Gulf of Mexico, Distribution patterns, Cultures, Electron microscopy, Atlantic Ocean, Pacific Ocean, Indian Ocean, Water sampling.
Identifiers: *Speciation, *Thalassiosira eccentrica, Thalassiosira symmetrica, Clones, Scanning electron microscopy, Light microscopy, Transmission electron microscopy, Thalassiosira mendiolana, Planktoniella sol, Coscinodiscus eccentricus.

Examination of original material from the Ehrenberg collection plus clonal cultures from the Gulf of Mexico and net hauls from widely separated stations in the world's oceans confirms that Coscinodiscus eccentricus is correctly placed as Thalassiosira eccentrica (Ehremb.) Cleve. A closely related species, T. symmetrica, is described, with the main differences being found in the value processes and distribution patterns. The former species is more abundant in the inshore waters; the latter has been found in oceanic waters. Comparisons are drawn between these 2 species, T. mendiolana and Planktoniella sol. (Holoman-Battelle)
W73-09312

THE RELATIONSHIP OF LIGHT, TEMPERATURE, AND CURRENT TO THE SEASONAL DISTRIBUTION OF BATRACHOSPERMUM (RHODOPHYTA),
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-09314

GROWTH AND EXCRETION IN PLANKTONIC ALGAE AND BACTERIA,
Scarborough Coll., Toronto (Ontario).
C. Nalewajko, and D. R. S. Lean.
Journal of Phycology, Vol 8, No 4, p 361-366, December 1972. 2 fig, 4 tab, 28 ref.

Descriptors: *Aquatic bacteria, *Aquatic algae, *Photosynthesis, *Growth rates, *Primary productivity, Radioactivity techniques, Distillation, Chlorophyta, Chrysophyta, Cyanophyta, Phytoplankton, Organic compounds, Lake Ontario, Path of pollutants, Carbon radioisotopes.
Identifiers: *Excretion, *Metabolities, Chlorella pyrenoidosa, Navicula pelliculosa, Anabaena flos-aquae, Asterionella formosa, Substrate utilization, Glycolate, C-14, Release rates, Chemical composition, Axenic cultures, Gel filtration, Inorganic carbon, Organic carbon, Heart Lake, Grenadier Pond, Filtrates, Culture media, Fate of pollutants.

In short-term experiments using cultures of Chlorella pyrenoidosa, Anabaena flos-aquae, Asterionella formosa, and Naviculla pelliculosa, both the proportion of photosynthetic products released from cells and the composition of these products altered with age. In the first 3 species, percentage extracellular release values increased with increasing growth rates, but the reverse trend was shown by Navicula. Fractionation of filtrates using Sephadex indicated that, in general, larger molecular weight compounds became predominant as cultures aged. Also a time-dependent shift in a similar direction occurred in cultures of all ages. In several lakes a predominance of large molecular weight compounds was apparent in filtrates even from short-term experiments. Filtrates of mixed cultures of planktonic bacteria growing on C-14 glycolate were found to contain large molecular weight organic compounds. It was demonstrated that in nonaxenic cultures of algae and in lake water, bacteria utilize low molecular weight extracellular metabolites of algae origin and larger molecular weight compounds are formed. (Holoman-Battelle)
W73-09315

THE UPTAKE OF GLUCOSE BY CHLAMYDOMONAS SP.,
North Carolina State Univ., Raleigh. Dept. of Zoology.
M. E. Bennett, and J. E. Hobbie.
Journal of Phycology, Vol 8, No 4, p 392-398, December 1972. 4 fig, 4 tab, 31 ref.

Descriptors: *Absorption, *Chlamydomonas, *Aquatic algae, *Velocity, Organic compounds, Carbohydrates, Phytoplankton, Protozoa, Invertebrates, Aquatic animals, Light intensity, Photosythesis, Primary productivity, Path of pollutants, Radioactivity techniques, Carbon radioisotopes.
Identifiers: *Heterotrophy, *Glucose, *Substrate utilization, Cellobiose, Maltose, Fructose, Substrate concentration, C-14.

The glucose uptake of a species of Chlamydomonas was studied at various concentrations of D-glucose plus glucose-1-C-14 (0.003-10.0 mg/liter) and at various light levels (0-220 ft-c). The alga grows at 4 C either in the light or in the dark with added glucose, cellobiose, maltose, or fructose. Uptake of glucose could be described by the Michaelis-Menten equation, and both the maximum velocity of uptake and the half-saturation constant increased when the cells were exposed to glucose in the dark. However, the high value of the half-saturation constant (5 mg glucose/liter) compared with the low levels of glucose in nature (5-10 micrograms/liter) makes it unlikely that a transport system is effective under natural conditions. Even if a total of 10.0 mg/liter of glucose plus other organic compounds were available as substrate, the rate of photosynthesis would still be more than 10 times higher (at 220 ft-c) than the rate of organic substrate uptake. Light had no effect on the total uptake of glucose but did reduce the percentage of C-14O2 evolved from 61 percent of the total C-14 taken up in the dark to 0 percent at 220 ft-c. This decrease could be due to either preferential use of the C-14O2 in photosynthesis or of the photosynthate in respiration. (Holoman-Battelle)
W73-09317

TURBULENT DIFFUSION OF OIL IN THE OCEAN,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. P. Murray.
Limnology and Oceanography, Vol 17, No 5, p 651-660, September 1972. 4 fig, 2 tab, 18 ref.

Descriptors: *Oceans, *Oil wells, *Mathematical studies, *Oil spills, *Theoretical analysis, Oceans, Marine environment, Oil wastes, Eddies, Diffusivity, Equations, Water pollution sources, Dispersion, Currents (Water).
Identifiers: *Turbulent diffusion, *Petroleum oil, Diffusion coefficients, Surface tension theory, Taylor turbulent diffusion theory, Fickian diffusion theory.

On-site observations of oil slick geometries and current speeds during the Chevron spill of March, 1970, in the Gulf of Mexico have allowed a comparative evaluation of the role of large-scale turbulence (in the form of a horizontal eddy diffusivity) and surface tension effects in the spreading of oil from a continuously emitting well into a steady current. The initial outline of the slick (roughly the first 50 percent of slick length) follows the laws of expansion as predicted by Taylor's turbulent diffusion theory. The gross size and overall shape (neglecting details of outline) of this type of slick are well represented by a solution of the Fickian diffusion equations which predict approximate slick geometry as a function of current speed, horizontal eddy diffusivity, the oil discharge rate, and an empirically determined constant (the boundary concentration). Under the conditions observed the effect of surface tension confined to within the first few hundred meters downslick and can probably be neglected for practical purposes under moderate oil discharge rates and current speeds as low as even 5 cm/sec. (Holoman-Battelle)
W73-09319

NITROGEN FIXATION IN CLEAR LAKE, CALIFORNIA. I. SEASONAL VARIATION AND THE ROLE OF HETEROCYSTS,
California Univ., Davis. Div of Environmental Studies.
For primary bibliographic entry see Field 05C.
W73-09321

NITROGEN FIXATION IN CLEAR LAKE, CALIFORNIA. II. SYNOPTIC STUDIES ON THE AUTUMN ANABAENA BLOOM,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 05C.
W73-09322

THE UPTAKE OF UREA BY NATURAL POPULATIONS OF MARINE PHYTOPLANKTON,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W73-09323

DISSOLVED FREE AMINO ACIDS IN SOUTHERN CALIFORNIA COASTAL WATERS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.
M. E. Clark, G. A. Jackson, and W. J. North.
Limnology and Oceanography, Vol 17, No 5, p749-758, September 1972. 3 fig, 4 tab, 33 ref.

Descriptors: *Amino acids, *Outlets, *Sewage effluents, *Water analysis, *Sea water, *Pollutant identification, Water sampling, Surface waters, Hypolimnion, Scuba diving, Separation techniques, Spectrophotometry, Chemical analysis, Connate water, Saline water, Organic acids, Solvent extractions, *California, Methodology.
Identifiers: *Coastal water, Sample preparation, Thin layer chromatography, Scintillation counting, Optical density, Organic solvents, Ornithine, Glycine, Alanine, Serine, Glutanic acid, Arginine, Lysine, Histidine, Aspartic acid, Ninhydrin, Valine, Threonine, Isoleucine, Leucine, Proline, Tryosine, Phenylalanine, Cystine, Methionine.

The dissolved free amino acids (DFAA) in seawater samples from an inshore area near a large

submarine sewage outfall and from an inshore area relatively remote from any major outfall were compared. Twenty samples were analyzed; all were collected from a small boat and immediately filtered on board using Millipore HA (0.45-micron) membrane filters to remove bacteria, plankton, and sediments. Precautions were taken to avoid contamination by ninhydrin-positive materials. Samples were stored on dry ice for transit to the laboratory, then frozen at minus 60 C to await analysis. Surface samples were taken directly over the side of the boat. Bottom and interstitial waters were collected by SCUBA divers using cylindrical Plexiglas containers of about 6 liters capacity. The amino acids were initially separated from salts by ligand exchange on Chelex-100 resin (BioRad) converted to the Cu-NH3 form and analyzed by thin-layer chromatography after complete desalting and eluting with NH4OH. Individual amino acids were estimated by the method of Clark (1968). After two-dimensional separation and color development with ninhydrin, individual spots were identified, cut out, and eluted in 2 ml of 50 percent aqueous n-propanol. Optical densities were determined at 570 nm on a microsample spectrophotometer. Quantities of amino acids were estimated from standard curves of chromatograms of a mixture of amino acids (Cal Biochem). Subsamples (1 ml) were taken for scintillation counting at each step in the procedure, so that overall loss of amino acids at each step was known. At both sites, surface waters contained DFAA levels of about 115 micrograms/liter (ca. 1 micromole/liter), about twice the value found in surface waters at both sites, with significantly more (290 micrograms or ca. 2.4 micromoles/liter) near an outfall than away from one (170 micrograms or ca. 1.6 micromoles/liter). Interstitial waters near the outfall contained about 350 micrograms or 3.0 micromoles DFAA/liter. The composition of the DFAA in all samples was similar to that obtained by other workers elsewhere. (Holoman-Battelle)
W73-09324

DIRECTION OF DRIFT OF SURFACE OIL WITH WIND AND TIDE,
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
N. W.Ridgway.
New Zealand Journal of Marine and Freshwater Research, Vol 6, Nos 1 and 2, p 178-184, June 1972. 4 fig, 11 ref.

Descriptors: *Oil spills, Movement, *Wind velocity, *Surface waters, Forecasting, Methodology, *Currents (Water), Aquatic drift, *Path of pollutants, Tidal streams, Mathematical studies, Oil wastes, Oily water.
Identifiers: *Vectorial addition, Wellington Harbor, New Zealand, Whangarei Harbor, Errors, Error sources.

The directions of surface oil slicks spreading from the wreck of t.e.v. Wahine during April 1968 are compared with predicted movements of surface water obtained by the vectorial addition of wind-induced surface currents and tidal currents. Wind factors of 1 percent, 2 percent, 3 percent, 4 percent, and 5 percent of recorded surface wind speeds were used to calculate wind-induced currents which were assumed to be in the same direction as the wind. The observed oil slick movements correspond best with the resultants obtained using a 3-5 percent wind factor, 60-64 percent of these falling within plus or minus 20 degrees of the observed directions of the oil slicks. Possible sources of error in the method are discussed and an example is given to illustrate how the method might be used to predict movements of surface oil resulting from an oil spillage. (Holoman-Battelle)
W73-09328

STANDARDS FOR FAECAL COLIFORM BACTERIAL POLLUTION,
Otago Univ., Dunedin (New Zealand). Dept of Microbiology.
For primary bibliographic entry see Field 05A.
W73-09331

ON THE QUANTITATIVE CHARACTERISTICS OF THE PELAGIC ECOSYSTEM OF DALNEE LAKE (KAMCHATKA),
For primary bibliographic entry see Field 05C.
W73-09340

MERCURY CONCENTRATION IN RELATION TO SIZE IN SEVERAL SPECIES OF FRESHWATER FISHES FROM MANITOBA AND NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. P. Scott, and F. A. J. Armstrong.
Journal of the Fisheries Research Board of Canada, Vol 29, No 12, p 1685-1690, December 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Absorption, *Mercury, *Freshwater fish, *Size, *Mathematical studies, *Regression analysis, Heavy metals, Canada, Yellow perch, Sauger, Walleye, Lake trout, Statistical methods, Path of pollutants.
Identifiers: White sucker, Burbot, Northern pike, Sheepshead, Lake whitefish, Tullibee, Goldeye, Catostomus commersoni, Lota lota, Perca flavescens, Stizostedion canadense, Stizostedion vitreum vitreum, Esox lucius, Freshwater drum, Aplodinotus grunniens, Coregonus clupeaformis, Coregonus artedii, Salvelinus namaycush, Hiodon alosoides.

Statistical analysis of 53 samples of 11 species of fishes from a number of areas of Manitoba and northwestern Ontario indicated that in general there was a positive correlation between mercury concentration and length. There also appeared to be a more variable positive relation between mercury concentration and fish condition (fatness). It was possible to predict, for 31 of the 53 samples, the range of lengths within which there was a 95 percent probability of all fish containing less than 0.5 ppm mercury. However, within species the relation between mercury concentration and length was not consistent. The results show that, for certain of the populations closed to commercial fishing because of mercury contamination, selection (by fishing technique or otherwise) of certain sizes should provide fish of acceptably low mercury concentration. (Holoman-Battelle)
W73-09346

USE OF A COMMERCIAL DREDGE TO ESTIMATE A HARDSHELL CLAM POPULATION BY STRATIFIED RANDOM SAMPLING,
Rhode Island Dept. of Natural Resources, Providence. Div. of Fish and Wildlife.
H. J. Russell, Jr.
Journal of the Fisheries Research Board of Canada, Vol 29, No 12, p 1731-1735, December 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Aminal populations, *Estimating, Statistical methods, Clams, Mollusks, Invertebrates, Marine animals, Efficiencies, Dredging.
Identifiers: *Stratified random sampling, *Mercenaria mercenaria, *Rocking-chair dredge, Performance evaluation, Random sampling, Sampling design, Quahog, Macroinvertebrates, Data interpretation.

Results are presented of the application of a Fall River rocking-chair dredge in a stratified random sampling design in which a limited number of samples sufficed to provide a reasonably accurate population estimate of M. mercenaria in Narragansett Bay, Rhode Island, Stratified random sampling was designed such that the preliminary dredge survey served to identify centers of abundance and provide the information necessary to construct contours enclosing areas of equal abundance. Subsequent sampling was then directed towards approaching equal sampling fractions based on areas between contours, or strata. Because of the nonrandom distribution pattern of M. mercenaria, treatment of the data with normal statistics would indicate a mean of 1.64 bu per dredge tow with a variance of 1.80. Stratified sampling, due to its inherent weighting feature, provided a similar estimate of 1.36 bu per tow with a variance of 0.033. (Holoman-Battell)
W73-09348

SALMON-CANNING WASTE WATER AS A MICROBIAL GROWTH MEDIUM,
Fisheries Research Board of Canada, Vancouver (British Columbia). Vancouver Lab.
For primary bibliographic entry see Field 05C.
W73-09350

HYPHOMYCETES UTILIZING NATURAL GAS,
University of Western Ontario, London. Dept. of Plant Sciences; and University of Western Ontario, London. Faculty of Engineering Science.
J. S. Davies, A. M. Wellman, and J. E. Zajic.
Canadian Journal of Microbiology, Vol 19, No 1, p 81-85, January 1973. 3 fig, 1 tab, 20 ref.

Descriptors: *Aquatic fungi, *Sewage sludge, *Isolation, *Natural gas, *Pollutant identification, Systematics, Activated sludge, Methodology, Aquatic microorganisms.
Identifiers: *Hyphomycetes, Substrate utilization, Sewage fungi, Ethane, Propane, n-butane, Graphium, Phialophora jeanselmei, Acremonium, Continuous cultures, Culturing techniques, Culture media, Aliphatic hydrocarbons, Coty's agar.

Twleve cultures of Hyphomyetes capable of growth upon the ethane component of natural gas were isolated from raw sewage by a continuous enrichment technique. Five continuous enrichment systems were operated simulataneously. Each consisted of a closed 4-liter Erlenmeyer flask containing Coty's mineral salts medium; the pH was adjusted with 2 N HC1. A mixture of 50 percent natural gas and 50 percent air was bubbled through each system. Agitation of the medium was effected by means of magnetic stirrers which also aided in dispersion of the gas bubbles. During the enrichment procedure fresh medium was pumped in daily by means of a multi-channel peristaltic pump and the effluent was harvested by positive gas pressure at the same rate, thus effecting dilution. Each system received an inoculum of 5 percent by volume of raw sewage, taken from several points in an activated sludge-sewage treatment plant. All five systems were run continuously for 6 weeks; after the first 2 weeks, attempts were made at weekly intervals to isolate individual fungi from the effluent of each system by the following method. Samples of the enrichment effluent were treated for 30 s in a waring Blendor to break up hyphal clumps into smaller fragments. Each sample was washed by suspending the hyphae in sterile Coty's medium (pH 5.5) followed by centrifugation at 100 g for 2 min. Tenfoled dilutions in sterile Coty's medium were made from the resulting suspension and 0.1-ml aliquots were spread over the surface of Petri plates of Coty's agar. Replicate plates of each dilution of the sample were incubated at room temperature (22-25 C) in desiccators, gassed manometrically as follows: (1) Methand 40 percent:air 60 percent, (2) Ethane 40 percent: air 60 percent, (3) Air 100 percent (control). The plates were examined regularly for growth; when significant growth of fungal colonies occurred, serial transfers were made to fresh medium until pure cultures were obtained. All isolates also grew on propane and n-butane but not methane. These cultures are described and their toxanomic position discussed. Four were tentatively placed in Graphium; three were identified as

Phialophora jeanselmei (Langeron) Emmons; the remaining five are similar to Acremonium sensu Gams. (Holoman-Battelle)
W73-09355

DEGRADATION OF POLYCHLORINATED BIPHENYLS BY TWO SPECIES OF ACHROMOBACTER,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
M. Ahmed, and D. D. Focht.
Canadian Journal of Microbiology, Vol 19, No 1, p 47-52, January 1973. 5 fig, 2 tab, 19 ref.

Descriptors: *Polychlorinated biphenyls, *Microbial degradation, *Sewage bacteria, Degradation (Decomposition), Isolation, Aerobic bacteria, Pollutant identification, Sewage effluents, Chemical analysis, Oxidation, Oxygen, Absorption, Mass spectrometry, Nuclear magnetic resonance, Aromatic compounds, Chlorides.
Identifiers: *Metabolites, *Achromobacter BP, *Achromobacter pCB, Culturing techniques, Heterotrophic bacteria, Fate of pollutants, Chlorinated hydrocarbons, Ultraviolet spectra, Mass spectra, Infrared spectra, NMR spectra, Substrate utilization, Culture media, p-Chlorobenzoic acid, p-Chlorobiphenyl, Ultraviolet spectrophotometry, Infrared spectrophotometry, Biphenyl, o-Phenylphenol, Phenylpyruvate, Catechol, 4-Phenylcatechol, Benzoic acid, o-Chlorobiphenyl, m-Chlorobiphenyl, o o'-Dichlorobiphenyl, p p'-Dichlorobiphyenyl.

Two species of Achromobacter were isolated from sewage effluent using biphenyl (BP) and p-chlorobiphenyl (pCB) respectively as sole carbon sources. Cultures of these bacteria were incubated at 28 C on a reciprocating shaker for 36 and 66 hours, respectively, to achieve stationary phases of growth. Oxygen uptake was determined at 30 C using a Gilson respirometer. To isolate the final products of degradation, the culture medium was centrifuged to obtain clear supernatant solutions. The supernatants were acidified with 1 N acetic acid. A compound was precipitated from the culture supernatant of pCB on acidification, whereas no precipitate was formed from the BP supernatant. The precipitate was washed twice with distilled water and dissolved in ethanol. Light brown crystals that were formed on evaporation of the alcohol were purified by crystallization with chloroform. The product was identified by uv., i.r., n.m.r., and mass spectral analyses. Acidified BP supernatant was extracted with diethyl ether. The crystalline material obtained on evaporation of the ether was recrystallized twice from ethanol. The compound was identified by uv. and i.r. spectral analyses. Achromobacter BP grown on biphenyl accumulated a product with an ultraviolet absorption maximum at 256 nm which could not be identified. Washed cell susspnsions of both isolates oxidized biphenyl, o-phenylphenol, phenylpyruvate, catechol, p-chlorobiphenyl, m-chlorobiphenyl, o-chlorobiphenyl, o,o'-dichlorobiphenyl, and p,p'-dichlorobiphenyl. Both isolates produced meta cleavage products by fission of the benzene ring. However, spectral characteristics of degradation products from respective substrates were different between the two isolates, indicating divergent degradation pathways. Benzoic and p-chlorobenzoic acids were produced from the degradation of BP and pCB, respectively, by Achromobacter pCB. Chloride was not produced by either isolate during the degradation of all chlorobiphenyls tested including the growth of Achromobacter pCB on p-chlorobiphenyl. (Holoman-Battelle)
W73-09356

ULTRASTRUCTURE OF TWO SPECIES OF OIL-DEGRADING MARINE BACTERIA,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. M. Atlas, and C. E. Heintz.
Canadian Journal of Microbiology, Vol 19, No 1, p 43-45, January 1973. 16 ref.

Descriptors: *Marine bacteria, *Microbial degradation, *Electron microscopy, *Cytological studies, Aerobic bacteria.
Identifiers: *Ultrastructure, *Crude oil, Flavobacterium, Brevibacterium, Heterotrophic bacteria bacteria, Light microscopy, Sample preservation, Sample preparation.

Two species of marine bacteria with the ability to degrade crude oil were compared ultrastructurally after growing in the presence and absence of oil. The procedure of negative staining was used to evaluate the specimens by electron microscopy. For observations by light microscopy, the organism cells were stained with Sudan black B according to Burdon's method of fat staining. Large electron-dense inclusions, which were located predominantly at the cell terminus, characterized species of Flavobacterium and Brevibacterium when growing on oil. Cells of Flavobacterium sp. had smaller inclusions when grown on marine agar, while inclusion bodies were not found in Brevibacterium sp. grown on marine agar. Sudan black B staining indicated the inclusions are stored lipids. (Holoman-Battelle)
W73-09357

A BAYESIAN APPROACH TO BIOASSAY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05C.
W73-09358

ESTIMATION OF MICROBIAL VIABILITY,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Applied Mathematics Div.
V. J. Thomas, N. A. Doughty, R. H. Fletcher, and J. G. Robertson.
Biometrics, Vol 28, No 4, p 947-958, December 1972. 3 tab, 8 ref.

Descriptors: *Estimating, *Viability, *Microorganisms, *Mathematical studies, *Model studies, Probability, Soil fungi, Water pollution effects, Environmental effects.
Identifiers: *Stochastic models, *Data interpretation, Slide culture techniques, Nocardia corallina, Cluster analysis, Random distribution, Pollutant effects.

Determinations of microbial viability, using the slide culture technique on suspensions in which organisms are aggregated to form clusters, give higher values than would be obtained if all organisms were suspended singly. Formulae have been derived for estimating the viability of individual organisms from the viability of clusters and the distribution of organisms among clusters of different sizes. With the limited stochastic model used it was assumed that clusters of a given size are randomly distributed over a slide and that the distributions of numbers of different sized clusters are statistically independent. An additional assumption was made to the effect that the probability of any organism being alive is constant with value pi, and that life or death for any one organism is an independent binomial variate with parameter pi. Depending on the method of sampling used there are two reasonable approaches for estimating the viability of individual organisms from the cluster viability and the cluster size distribution. (1) The first approach depends on a sampling scheme in which a count is made of the number of live and dead clusters for each cluster size over a number of separate samples. In practice this could be carried out by counting the same field of view on a microscope slide before and after growth of the clusters. (2) If preparation of a sample for counts of live clusters differs from, and is incompatible with, preparation for counts of cluster sizes, two separate sets of samples are used. The latter method was used for estimating viability on suspensions of Nocardia corallina. A difference of 8.8 percent was obtained between the viability of clusters and that of individual organisms. This value was considerably greater than the degree of incertainty in both estimates. Itwas concluded that clustering does have a considerable effect on viability determination and it should be considered especially where interpertations of intracellular materials on maintenance of viability are to be made. (Holoman-Battelle)
W73-09360

INVERSE BINOMIAL SAMPLING AS A BASIS FOR ESTIMATING NEGATIVE BINOMIAL POPULATION DENSITIES,
For primary bibliographic entry see Field 07B.
W73-09362

MICROBIAL DEGRADATION OF CRUDE OIL: FACTORS AFFECTING THE DISPERSION IN SEA WATER BY MIXED AND PURE CULTURES,
Tel Aviv Univ. (Israel). Dept. of Microbiology.
A. Reisfeld, E. Rosenberg, and D. Gutnick.
Applied Microbiology, Vol 24, No 3, p 363-368, September 1972. 4 fig, 4 tab, 14 ref.

Descriptors: *Microbial degradation, *Sea water, *Dispersion, *Kinetics, *Environmental effects, Oil spills, Oil wastes, Marine bacteria, Aerobic bacteria, Hydrogen ion concentration, Inhibition, Nitrogen, Phosphorus, Nutrient requirements, Isolation, Oil pollution.
Identifiers: *Crude oil, *Fate of pollutants, Enrichment, Arthrobacter, Mixed cultures, Pure cultures, Culturing techniques, Hexadecane, Heterotrophic bacteria, Substrate utilization, Emulsification, Azide, Culture media.

By means of the enrichment culture technique, a mixed population of microorganisms was obtained which catalyzed the dispersion of crude oil in supplemented sea water. From this enrichment culture, eight pure cultures were isolated and studied. Only one of the isolates (RAG-1) brought about a significant dispersion of crude oil. RAG-1 has been tentatively characterized as a member of the genus Arthrobacter. The other seven isolates gave rise to colonies on supplemented oil agar, but were neither able to disperse oil nor to stimulate the dispersion catalyzed by RAG-1. The dispersion of crude oil by either RAG-1 or the enrichment culture was absolutely dependent on exogenous sources of nitrogen and phosphorus and completely inhibited by 0.01 M azide. The increase in cell number of RAG-1 was directly proportional to the concentration of crude oil added to the medium over the range 0.05 to 1.0 mg/ml. Within this linear region, 1.0 mg of crude oil yielded 90 billion cells and approximately 65 percent of the oil was converted into a nonbenzene extractable form. Accompanying the emulsification was a decrease in the pH from 7.6 to 5.0. Acidic conditions, however, were neither necessary nor sufficient for oil dispersion. When sea water was supplemented with 0.029 mM K2HPO4 and 3.8 mM (NH4)2SO4 and inoculated with RAG-1, oil dispersion occurred within 1 day. This dispersion could also be brought about by the supernatant following separation of the cells from the medium. Similarly, the supernatant obtained following growth of RAG-1 on hexadecane was capable of emulsifying crude oil in 60 min. (Holoman-Battelle)
W73-09365

MICROBIAL POPULATION OF FEEDLOT WASTE AND ASSOCIATED SITES,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
R. A. Rhodes, and G. R. Hrubant.
Applied Microbiology, Vol 24, No 3, p 369-377, September 1972. 4 fig, 1 tab, 14 ref.

Descriptors: *Farm wastes, *Feed lots, *Cattle, *Runoff, *Pollutant identification, *Microorganisms, Confinement pens, Coliforms, Anaerobic bacteria, Yeasts, Fungi, Water pollution sources, Sampling, Methodology, Bacteria, Isolation, Soil disposal fields, Domestic animals, Ruminants, Analytical techniques.
Identifiers: Sample preparation, Culture media, Streptomycetes, Enumeration.

A quantitative determination was made every 2 months for a year of the microflora of beef cattle waste and runoff at a medium-sized midwestern feedlot. Counts were obtained for selected groups of organisms in waste taken from paved areas of pens cleaned daily and, therefore, reflect the flora of raw waste. Overall, in terms of viable count per gram dry weight, the feedlot waste contained 10 billion total organisms, one billion anaerobes, 100,000,000 gram-negative bacteria, 10,000,000 coliforms, 1,000,000 sporeformers, and 100,000 yeasts, fungi, and streptomycetes. The specific numbers and pattern of these groups of organisms varied only slightly during the study in spite of a wide variation in weather. Data indicate that little microbial growth occurs in the waste as it exists in the feedlot. Runoff from the pens contained the same general population pattern but with greater variation attributable to volume of liquid. Comparable determinations of an associated field disposal area (before and after cropping), stockpiled waste, and elevated dirt areas in the pens indicate that fungi, and especially streptomycetes, are the aerobic organisms most associated with final stabilization of the waste. Yeasts, which are the dominant type of organism in the ensiled corn fed the cattle, do not occur in large numbers in the animal waste. Large ditches receiving runoff and subsurface water from the fields have a population similar to the runoff but with fewer coliforms. (Holoman-Battelle)
W73-09366

ENTEROBACTERIA IN FEEDLOT WASTE AND RUNOFF,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
G. R. Hrubant, R. V. Daugherty, and R. A. Rhodes.
Applied Microbiology, Vol 24, No 3, p 378-383, September 1972. 6 tab, 12 ref.

Descriptors: *Cattle, *Feed lots, *Runoff, *Enteric bacteria, *Farm wastes, *Pollutant identification, Isolation, Aerobic bacteria, E. coli, Domestic animals, Ruminants, Pseudomonas, Sampling, Salmonella, Coliforms.
Identifiers: *Drainage ditches, Enterobacteriaceae, Enrichment, Culture media, Plate counts, Selective media, Citrobacter, Klebsiella, Enterobacter cloacae, Proteus vulgaris, Proteus morganii, Proteus mirabilis, Proteus rettgeri, Providencia stuartii, Bacillus spp, Arizona, Enterobacter aerogenes, Enterobacter liquefaciens, Providencia alcalifaciens.

Samples of beef cattle feedlot waste (FLW), runoff from the pens, and water from a large drainage ditch at the feedlot were examined for Enterobacteriaceae. The drainage ditch receives the runoff but contains primarily subsurface drainage from fields on which FLW is spread for disposal. Plating and enrichment techniques with seven different media were used to isolate 553 cultures of enterobacteria. FLW contains about 50 million enterobacteria/g dry weight. More than 90 percent of these were Escherichia coli, none of which were enteropathogenic types as determined with multivalent sera. Citrobacter and Enterobacter cloacae were other organisms present in moderate numbers. Application of enrichment techniques broadened the spectrum of enterobacteria isolates to include the four Proteus spp., both Providencia spp., Klebsiella, Enterbacter aerogenes, Arizona, and a single isolate of Salmonella (serological group C2). Shigella was not isolated. The wide spectrum of enterobacteria in FLW may be a hazard if unsterilized waste is refed. Fewer enterobacteria occurred in the runoff and in the drainage ditch; the most numerous species in FLW also were most numerous at these sites. However, neither Salmonella nor Arizona was isolated from runoff or drainage-ditch waters. (Holoman-Battelle)
W73-09367

WATER POLLUTION MONITORING,
California Univ., Berkeley. Dept. of Geoscience Engineering.
For primary bibliographic entry see Field 05A.
W73-09369

ACCUMULATION AND PERSISTENCE OF DDT IN A LOTIC ECOSYSTEM,
Maine Univ., Orono. Dept. of Entomology.
J. B. Dimond, A. S. Getchell, and J. A. Blease.
J Fish Res Board Can. Vol 28, No 12, p 1877-1882. 1972.
Identifiers: *Path of pollutants, Accumulation, Birds, *DDT, Ecosystem, Fish, Invertebrates, Plants, *Maine.

DDT persisted in streams of several small watersheds in Maine for at least 10 yr following light applications to the forest. Residues declined sharply within 2 or 3 yr after application, but after 10 yr were still well above concentrations detected in untreated streams. This was true of all components studied: muds, plants, invertebrates, fish, and fish-eating birds. The prolonged persistence led to cumulative residue levels in streams sprayed more than once. Concentration of residues through the food chain was evident.--Copyright 1972, Biological Abstracts, Inc.
W73-09415

TRANSITION OF POLLUTION WITH MERCURY OF THE SEA FOOD AND SEDIMENTS IN MINAMATA BAY (IN JAPANESE),
Kumamoto Univ. (Japan). Dept. of Hygiene.
K. Irukayama, M. Fujiki, S. Tajima, and S. Omori.
Jap J Public Health. Vol 19, No 1, p 25-32. 1972. Illus. English summary.
Identifiers: *Path of pollutants, Industrial wastes, Waste disposal, Effluents, Fish, Hair, Japan, *Mercury, Minamata Bay, Water pollution, Seafood, Sediments, Shellfish, Water pollution effects.

Since the end of 1959, a chemical factory has disposed of effluents from its acetaldehyde and vinyl chloride plant, in which Hg was used as catalyst, into Minamata Bay. Methods of waste disposal were revised several times, but in May, 1968, the production of acetaldehyde was stopped, and in June, 1971, the method of production of vinylchloride was changed to use acetylene instead of ethylene. At present no Hg is used in the factory. Since the beginning of 1960, the Hg contents in the sea food from Minamata Bay have gradually decreased. In 1970, Hg contents in the fish from Minamata Bay showed below 0.5 micro g/g of wet weight and Hg contents in the hair of inhabitants in Minamata City was below 5 micro g/g in average. Abundant sediments containing Hg were deposited in the bottom of Minamata Bay, almost all in the form of inorganic Hg compounds, although a trace of methyl mercury was detected.--Copyright 1972, Biological Abstracts, Inc.
W73-09416

TRITIUM AND ITS EFFECTS IN THE ENVIRONMENT--A SELECTED LITERATURE SURVEY,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05C.
W73-09433

GRAYS HARBOR ESTUARY, WASHINGTON: REPORT 3, WESTPORT SMALL-BOAT BASIN STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-09438

REGIONAL RATES OF GROUND-WATER MOVEMENT ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 02F.
W73-09441

SPECIFIC-CONDUCTANCE SURVEY OF THE MALAD RIVER, UTAH AND IDAHO,
Geological Survey, Logan, Utah.
For primary bibliographic entry see Field 02K.
W73-09448

HYDROGEOLOGICAL CRITERIA FOR EVALUATING SOLID-WASTE DISPOSAL SITES IN JAMAICA AND A NEW WATER SAMPLING TECHNIQUE,
Geological Survey of Jamica, Kingston.
R. M. Wright.
Journal of the Scientific Research Council of Jamaica, Vol 3, No 2, p 59-92, 1972. 6 fig, 4 tab, 53 ref.

Descriptors: *Waste disposal, *Solid wastes, *Sanitary engineering, *Landfills, *Water pollution sources, Water quality, Monitoring, Instrumentation, Specific conductivity, Leaching, Path of pollutants, Groundwater, Groundwater movement.
Identifiers: *Jamaica.

The hydrogeological factors for evaluating sanitary landfill sites in Jamaica are described. Favorable topography includes flat upland areas, heads of gullies and ravines, disused quarries, and dry strip mines. Unfavorable topography includes lower reaches of gullies, depressions where water accumulates, stream flood plains, and sites where leachate might discharge into water. Favorable bedrocks are shale and granodiorite. Unfavorable bedrocks are sandstone, cavernous limestone, and cavernous dolomite. Favorable unconsolidated deposits are clays and silts. Unfavorable materials are sand and gravel less than 50 feet thick. Thickness requirements vary depending on the nature and drainage characteristics of unconsolidated materials. Local sources (and potential sources) of water are favorable in deep bedrock wells; in sand, gravel and alluvium wells with thick impermeable cover over aquifers; and in dug wells if more than 500 feet from the landfill site; and unfavorable in shallow bedrock wells and in sand, gravel and alluvium wells with thin cover. (Woodard-USGS)
W73-09452

SUBSURFACE WASTEWATER INJECTION, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05E.
W73-09456

TRACE ELEMENTS IN SOILS AND FACTORS THAT AFFECT THEIR AVAILABILITY,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
R. L. Mitchell.
Geological Society of America Bulletin, Vol 83, No 4, p 1069-1076, April 1972. 6 fig, 18 ref.

Descriptors: *Trace elements, *Soils, *Agriculture, Animal pathology, Human pathology, Heavy metals, Metals, Drainage, Irrigation, Precipitation, Drainage effects, Plants, Nutrients, Geochemistry, Air pollution, Water pollution, Plant uptake, Chelation, Soil investigations.

Plants are dependent on the local soil, and the intake of farm animals can be regulated, but man draws his food, and so his trace elements, from the most convenient source. Nevertheless, soil is ultimately the primary natural source of trace elements in animals and man. The factors that control their levels in different soils, their availability to plants, and their contents in different plant species are discussed from the point of view of the amounts available to animals and man. (Author's abstract)
W73-09468

DISTRIBUTION OF TRACE ELEMENTS IN THE ENVIRONMENT AND THE OCCURRENCE OF HEART DISEASE IN GEORGIA,
Geological Survey, Denver, Colo.
H. T. Shacklette, H. I. Sauer, and A. T. Miesch.
Geological Society of America Bulletin, Vol 83, No 4, p 1077-1082, April 1972. 1 fig, 7 ref.

Descriptors: *Trace elements, *Georgia, *Human pathology, *Soils, Human diseases, Metals, Heavy metals, Plants, Food chains, Nutrition, Distribution pattern, Vegetable crops, Geochemistry, Phosphorus, Sampling, Irrigation, Soil investigations.
Identifiers: *Cardiovascular diseases.

The concentrations of certain chemical elements in native plants, garden vegetables, and soils were studied in two areas of Georgia, each made up of nine countries, that have greatly different heart disease mortality rates. The soils of the two areas were found to be geochemically distinct. The greater amounts of trace elements in soils occur in the counties that have the lower death rates, but the abundances of trace elements in trees and vegetables do not correspond closely to the abundances in the soils. The trace elements in soils, however, may have entered the human food chain in water, in other food plants, and in meat and milk that were not sampled in this study. If geochemical differences between the soils of the high-death-rate area and low-death-rate area do, in fact, have a causal relationship to death from cardiovascular diseases, the cause would appear to be a deficiency, rather than an excess, of the elements that were studied. (Olezkiewicz-Vanderbilt)
W73-09469

LEAD IN SOILS AND PLANTS: A LITERATURE REVIEW,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
R. L. Zimdahl, and J. H. Arvik.
CRC Critical Reviews in Environmental Control, p 213-224, February 1973. 129 ref. NSF Grant GI-34813X.

Descriptors: *Lead, *Soil contamination, *Soil-water-plant relationships, *Toxicity, Biology, Plant physiology, Heavy metals, Environmental effects, Pollutants, Atmosphere, Soil, Surveys, Soil profiles, Plant growth, Vascular tissues, Root systems, Plant tissues, Organic compounds.

The distribution of lead in the environment is altered by the activities of man, principally through its use as a fuel additive. Lead appears in automobile exhaust as halides, hydroxides, and oxides, with lesser amounts of carbonates and sulfates. Lead concentrations decrease rapidly with depth in the soil and distance downwind from a source, and show a positive correlation with traffic volume. Lead in soil is moved slowly by leaching, due to sorption and formation of insoluble compounds. Sorption of lead by soils is positively correlated with cation exchange capacity. Lead can be taken up by plant roots if in an available form, but soil sorption phenomena and precipitation prevent uptake of large amounts unless soil lead levels are extremely high. At present we do not know the definition of available lead. Lead can be absorbed by plant foliage but much of it is apparently in the form of a surface deposit. Lead content of plants grown in natural soils is generally less than 10 ppm d.w. When taken up by a plant, lead may be found principally in the roots, with little translocation to the shoot. Lead uptake is enhanced by low soil pH and can be reduced by liming the soil. (Jerome-Vanderbilt)
W73-09479

MERCURY IN THE ATMOSPHERE,
S. H. Williston.
Journal of Geophysical Research, Vol 73, No 22, p 7051-7055, November 18, 1968. 2 fig, 3 ref.

Descriptors: *Mercury, *Air pollution, *Analytical techniques, Sampling, Testing, Laboratory equipment, Wind velocity, Temperature, Smog, Atmosphere.
Identifiers: *Mercury pollution.

High-sensitivity mercury-vapor analysis has been automated to provide a continuous monitoring of mercury in the earth's atmosphere over the last 2-year period. In the San Francisco Bay area (Los Altos) winter concentrations range from slightly >1/2 to 25 nanograms of mercury per cubic meter of air. Summer concentrations range from slightly over 1 to 50 nanograms per cubic meter. Concentration of mercury seems to depend primarily on wind direction, wind speed, and seasonal temperature variations. Numerous other variables also affect it. It is shown that high mercury levels always coincide with high smog levels. (Oleszkiewicz-Vanderbilt)
W73-09489

PARTICLES CONTAINING LEAD, CHLORINE, AND BROMINE DETECTED ON TREES WITH AN ELECTRON MICROPROBE,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology.
For primary bibliographic entry see Field 05A.
W73-09494

RADIOCHEMICAL STUDIES ON EFFECT OF BATHING: II. EFFECT OF SERIAL BATHING ON DISTRIBUTION OF MERCURY COMPOUNDS IN MICE, (IN JAPANESE),
Kyushu Univ., Beppu (Japan). Inst. of Balneotherapeutical Research I.
For primary bibliographic entry see Field 05C.
W73-09496

METHYLMERCURY IN NORTHERN PIKE (ESOX LUCIUS): DISTRIBUTION, ELIMINATION, AND SOME BIOCHEMICAL CHARACTERISTICS OF CONTAMINATED FISH,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
W. L. Lockhart, J. F. Uthe, A. R. Kenney, and P. M. Mehrle.
Journal of the Fisheries Research Board of Canada, Vol 29, No 11, p 1519-1523, 1972. 4 tab, 18 ref.

Descriptors: *Mercury, *Pikes, *Biopsy, Distribution, Water pollution sources, Biochemistry, Organic compounds, Inorganic compounds, Fish, Lakes, Sampling, Evaluation, Environmental effects, On-site data collection.
Identifiers: *Methylmercury.

Northern pike heavily contaminated with methylmercury were captured from Clay Lake, Ontario, and released in Heming Lake, Manitoba, an area relatively free of mercury. Mercury levels in muscle biopsy samples at the time of transfer and at subsequent recaptures indicated that only 30% was eliminated in one year. Distribution among various body tissues was essentially unchanged, those organs most heavily contaminated being lens, kidney, and liver in decreasing order. Biochemical profiles of blood serum constituents showed several differences between samples from the two lakes, especially in levels of inorganic phosphate, total protein, alkaline phosphatase, and cortisol. Serum values for transplanted fish tended toward those in the clean lake and we have concluded that biochemical profiles were sensitive to the environmental change. (Jerome-Vanderbilt)
W73-09498

ECOLOGICAL STUDIES IN THE MAMMOTH CAVE SYSTEM OF KENTUCKY: II. THE ECOSYSTEM,
Kentucky Univ., Lexington. Inst. of Speleology.
For primary bibliographic entry see Field 05C.
W73-09503

DISTRIBUTION AND EXCRETION RATE OF PHENYL- AND METHYLMERCURY NITRATE IN FISH, MUSSELS, MOLLUSCS AND CRAYFISH,
Helsinki Univ. (Finland). Dept. of Radiochemistry.
For primary bibliographic entry see Field 05C.
W73-09508

MONITORING ZINC CONCENTRATIONS IN WATER USING THE RESPIRATORY RESPONSE OF BLUEGILLS (LEPOMIS MACROCHIRUS RAFINESQUE),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
R. E. Sparks, J. Cairns, Jr., R. A. McNabb, and G. Suter II.
Hydrobiologia, Vol 40, No 3, p 361-369, 1972. 7 fig, 5 ref. EPA Project 18050 EDQ.

Descriptors: *Sunfish, *Respiration, *Zinc, *Measurement, *Analytical techniques, Biochemistry. Physiology, Fish, Metabolism, Mortality, Toxicity, Water pollution, Evaluation, Heavy metals.

Pressure changes in both the buccal and opercular cavities of bluegill sunfish exposed to lethal and sublethal concentrations of zinc, were measured according to a method developed by Schaumburg, Howard, and Walden. The object was to determine whether this measuring technique might be useful in monitoring heavy metal pollution. Fish were exposed to varying concentrations of ZnSO4-7H20 and respiration and coughing rates were measured along with cavity pressure levels. Zinc induced coagulation and sloughing of mucus in bluegills and the function of coughing might be to reverse water flow through the gills in order to free them of mucus. The coughing rates increase proportionally to the concentration of zinc in the water. Although useful physiological information was obtained by recording pressure in both the buccal and opercular cavities, it appears that cannulation of the mouth alone would provide sufficient information on minor toxicants. Measuring cough frequency of bluegills is a good monitoring technique for zinc. (Jerome - Vanderbilt)
W73-09510

SIGNIFICANCE OF MERCURY IN THE ENVIRONMENT,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
J. G. Saha.
Residue Reviews, Vol 42, p 103-163, 1972. 15 tab, 229 ref.

Descriptors: *Mercury, *Path of pollutants, *Public health, *Toxins, Biochemistry, Chemistry, Pollution, Biological communities, Ecological distribution, Industrial production, Environmental effects, Industrial wastes, Food chains, Aquatic populations, Fish, Diseases, Heavy metals, *Reviews, *Bibliographies.

A general review of mercury in the environment and its effects on the biological community in general and humans in particular is presented. There is a natural circulation of mercury in the environment called the background mercury level, which ranges from less than 1 ppb in the atmosphere to approximately 1 or 2 ppm in soil; and which seems relatively harmless to man. In addition to the background mercury, man's activities in manufacturing and agriculture contribute considerable amounts of mercury to the environment. Levels of mercury in a large variety of materials are listed. Occupational exposure to mercury and high concentrations of mercury in the food chain are capable of affecting the central nervous system and causing genetic defects with toxicity depending on the type of compound. Two estimates of allowable daily intakes are presented and discussed. The allowable level of mercury in food in the U.S. and Canada is 0.5 ppm, which makes it unlikely that fish eaters in these countries will ever have harmful consumption levels of this element. (Jerome - Vanderbilt)
W73-09511

MICROBIAL UPTAKE OF LEAD,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W73-09514

PYROPHOSPHATE HYDROLYSIS IN SOIL AS INFLUENCED BY FLOODING AND FIXATION,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-09516

POTENTIOMETRIC TITRATION OF SULFATE IN WATER AND SOIL EXTRACTS USING A LEAD ELECTRODE,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02K.
W73-09518

GASEOUS LOSSES OF NITROGEN FROM FRESHLY WETTED DESERT SOILS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W73-09519

HYDROLYSIS OF PROPAZINE BY THE SURFACE ACIDITY OF ORGANIC MATTER,
Agricultural Research Service, Beltsville, Md. Soils Lab.
D. C. Nearpass.
Soil Sci Soc Am Proc. Vol 36, No 4, p 606-610, 1972. Illus.
Identifiers: Acidity, Adsorption, Herbicides, *Hydrolysis, *Organic matter, *Propazine, Water pollution sources.

Propazine (2-chloro-4, 6 bis (isopropylamino)-s-triazine) hydrolysis in acidic aqueous soil-free systems was pH dependent, increasing with lower pH values. At a given pH, degradation followed first-order kinetics. At 23.5 degC, the relationship was log t1/2 (days) ± 0.59 pH-0.21. Adsorption of propazine by organic matter prepared from Michigan peat was also pH dependent, but both molecular and cationic adsorption occurred. An increased rate of degradation in the presence of organic matter was postulated as due to hydrolysis by ionized surface H. Increasing the Ca saturation resulted in decreased hydrolysis. Increasing the CaCl2 concentration of the propazine-organic matter-aqueous system had no effect on acid hydrolysis. In the salt-amended systems, an increased hydrolysis, to be expected from the lower pH in the ambient solution, was apparently offset by a decreased hydrolysis due to the lowered amounts of ionized surface H.--Copyright 1973, Biological Abstracts, Inc.
W73-09520

CHARACTERIZATION OF THE OXIDIZED AND REDUCED ZONES IN FLOODED SOIL,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-09522

GEOGRAPHICAL INFLUENCE ON COOLING PONDS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
E. L. Thackston, and F. L. Parker.
J Water Pollut Control Fed. Vol 44, No 7, p 1334-1351. 1972. Illus.
Identifiers: *Cooling ponds, Geographical effects, *Thermal pollution, *Energy budget.

The energy budget approach was outlined and applied to cooling ponds. Monthly average weather data from 88 stations throughout the USA were used to calculate equilibrium temperatures, heat exchange coefficients, and amount of cooling in various-sized ponds receiving the effluent from a standard power plant of 1000-Mw capacity, both for average and extreme weather conditions. The data for each station were plotted on a chart, and the variation of these results across the USA is depicted by a series of maps of the USA with contours connecting equal values of the parameters. The maps disclose variations across the USA on a given date, of up to 55 degree F (30.5 degree C) in equilibrium temperature, up to 100% difference in heat exchange coefficients, up to 50% difference in heat lost from a given pond size, and up to 200% difference in the size of a pond necessary to produce an equal cooling effect. The results may also be used to estimate cooling pond performance for power plants of other sizes.--Copyright 1972, Biological Abstracts, Inc.
W73-09525

BIODEGRADATION OF ANIMAL WASTE BY LUMBRICUS TERRESTRIS,
Georgia Univ., Athens. Dept. of Dairy Science.
For primary bibliographic entry see Field 05G.
W73-09528

EFFECT OF THE WASTE-WATER OF SUGAR--WORKS ON NATURAL HISTORY OF THE ZAGYVA RIVER,
Authority Water Conservancy Middle Course Tisza, Szolnok (Hungary).
J. Hamar.
Tiscia. Vol 6, p 109-128. Illus. 1970/1971.
Identifiers: History, *Hungary, Rivers, Sugar industry, *Waste water pollution, *Zagyva River.

The chemical composition and natural history of the Zagyva river, as well as changes as a result of various waste-water are analyzed. The effect of standing depends upon the water output, while the influence of periodical pollutions (waste-water waves) depends primarily on the storage time of waste-water.--Copyright 1972, Biological Abstracts, Inc.
W73-09538

PHYTOPLANKTON, PHOTOSYNTHESIS, AND PHOSPHORUS IN LAKE MINNETONKA, MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05C.
W73-09546

CATALYTIC OXIDATION OF PHENOL OVER COPPER OXIDE IN AQUEOUS SOLUTION,
Delaware Univ., Newark. Dept. of Chemical Engineering.
A. Sadana.
M Sc Thesis, June 1972. 143 p, 13 fig, 53 ref. 7 append. OWRR A-014-DEL (2).

Descriptors: *Oxidation, *Aqueous solutions, *Catalysts, *Laboratory tests, Phenols, Copper, Analytical techniques, Kinetics, Autoclaves, Oxygen, Acids, Temperature.

The catalytic oxidation of phenol in dilute aqueous solution was studied at temperatures of 25 deg to 150 deg C and oxygen partial pressures of 1 to 9 atmospheres. The studies were carried out in a stirred flask and in a stirred autoclave with a supported copper oxide catalyst slurried in the solution. In the intrinsic kinetic regime the oxidation is first order in phenol and in oxygen. The reaction exhibited an induction period with a rate constant of about 10% that of the constant activity region. The activation energy for this regime was 38.8 k cal/mole. Similar behavior was exhibited in the severe diffusional limitations regime where the activation energy decreased by nearly half from 38.8 to 25.0 cal/mole. Very small concentrations of catechol, maleic and oxalic acids as intermediates in the oxidation reaction were detected. Another intermediate, possibly hydroquinone, is present in an appreciable amount. (Woodard-USGS)
W73-09587

THE EFFECT OF MIXING AND GRAVITATIONAL SEGREGATION BETWEEN NATURAL GAS AND INERT CUSHION GAS ON THE RECOVERY OF GAS FROM HORIZONTAL STORAGE AQUIFERS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 04B.
W73-09589

CIRCULATION AND BENTHIC CHARACTERIZATION STUDIES--ESCAMBIA BAY, FLORIDA.
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.

Available from NTIS, Springfield, VA 22151 PB-13 302, Price $3.00 printed copy; $0.95 microfche. Environmental Protection Agency Southeast Water Laboratory Technical Services Program Publication, February 1971. 33 p, 17 fig, 3 tab, 8 ref, 5 append.

Descriptors: *Bays, *Florida, *Water circulation, *Path of pollutants, *Bottom sediments, Oxygen demand, Water pollution sources, Water pollution effects, Estuaries.
Identifiers: *Escambia Bay (Fla).

The sediments of Escambia Bay, Florida, are highly organic. Tidal circulation in Upper Escambia Bay is poor. Because of these conditions, sediment disturbances, such as caused by dredging, can cause sever oxygen depletion. Massive fish kills could result. The Escambia River flows southeastward into the bay, creating a large eddy current counterclockwise to the north, which impedes tidal exchange in Upper Escambia Bay. During low-flow periods, the small creeks in the extreme northern end of the bay do not discharge a sufficient amount of freshwater to flush the area, and persistent pollutants are effectively trapped. Organic carbon content of bay sediment ranges from 2.3 to 5.0%. Sediment containing more than 3.0% organic carbon covers 46% of the upper bay. (Knapp-USGS)
W73-09592

A REPORT ON THE PROTOTYPE CURRENT VELOCITY AND SALINITY DATA COLLECTED IN THE UPPER CHESAPEAKE BAY FOR THE CHESAPEAKE BAY MODEL STUDY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W73-09595

EVALUATION OF MEASUREMENT METHODS AND INSTRUMENTATION FOR ODOROUS COMPOUNDS IN STATIONARY SOURCES. VOLUME 1---STATE OF THE ART,
Esso Research and Engineering Co., Linden, N.J. Government Research Div.
For primary bibliographic entry see Field 05A.
W73-09601

THE 1971 VIRGINIA PESTICIDE STUDY, (PURSUANT TO HOUSE JOINT RESOLUTION 51).
Virginia Dept. of Agriculture and Commerce, Richmond.
For primary bibliographic entry see Field 05G.
W73-09642

BIOLOGICAL ASPECTS OF OIL POLLUTION IN THE MARINE ENVIRONMENT, A REVIEW,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 05C.
W73-09643

DIFFUSION OF THE DISCHARGED SUSPENDED MATTER IN COASTAL REGION (IN JAPANESE),
North Pacific Fisheries Inst., Sapporo (Japanese).
M. Kajihara, N. Inoue, and T. Nakamura.
Bulletin of the Faculty of Fisheries Hokkaido University, Vol 23, No 1, p 17-28, May 1972. 9 fig, 8 ref.

Descriptors: Asia, *Coasts, *Discharge, *Effluents, *Discharge measurement, Model studies, Suspended solids, Distribution, Water pollution sources, *Path of pollutants, Diffusion, Fisheries.
Identifiers: *Japan, Flow factors.

Discharged wastes in the coastal region off Yoshioka, Japan are a serious threat to the fishery industry. Small-scale distributions of suspended matter were studied in the field as well as in laboratory experiments. Typical examples of samples showing clear distributions of suspended matter are presented. A theoretical model is developed assuming that the discharged suspended matter has a Gaussian distribution along arc y having its peak at current arc x with an exponential form under vertical arc z. The model is not sufficient, however, to explain actual diffusion of suspended matter where the flow is unsteady both in time and space. (Ensign-PAI)
W73-09645

CYCLING OF ELEMENTS IN ESTUARIES,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
D. A. Wolfe, and T. R. Rice.
Fishery Bulletin, Vol 70, No 3, p 959-972, July 1972. 3 tab, 52 ref.

Descriptors: *Metals, *Estuaries, *Path of pollutants, *Transfer, Model studies, Systems analysis.
Identifiers: *Elemental transformation, *Elemental turnover, *Contaminant metals.

The nature of the information required for the development of useful models for the cycling of contaminant metals in estuarine systems is examined and briefly discussed. An effort is made to conceptualize the elemental cycling system that operates in the southeastern coastal zone estuaries of the U.S. Topics discussed include the mechanisms and pathways of elemental transformation, the rates of elemental turnover among reservoirs of contaminant metals, and the responses of existing processes to changes in the environment. The complexity of the ecosystem, however, makes precise quantification of all the reservoirs and all the transfer rates virtually impossible. A systems model is presented as an initial step in the development of dynamic mathematical models of elemental cycling. Major gaps in existing knowledge are outlined and the need for a holistic approach to further research is stressed. (Ensign-PAI)
W73-09647

UNSTRUCTURED MARINE FOOD WEBS AND 'POLLUTANT ANALOGUES',
Scripps Institution of Oceanography, La Jolla, Calif.
J. D. Isaacs.
Fishery Bulletin, Vol 70, No 3, p 1053-1059, July 1972. 1 fig, 1 tab, 1 ref.

Descriptors: *Cesium, Fish, *Oceans, *Food chains, *Food webs, Trace elements, Trophic level, Water pollution sources, Marine animals.
Identifiers: *Gulf of California, *Salton Sea.

Cesium levels in several species of fish living in the Gulf of California differ substantially from levels of the same species living in the Salton Sea. Simplified trophic models of the two environments are developed by applying known information about the food chain in the Salton Sea to the more uncertain food web in the Gulf of California. Data on an unstructured food web matrix and equations are presented. It is believed that the study of concentrations of cesium and other natural trace elements in marine organisms may lead to an understanding of the trophic position of the organisms. Such an understanding could yield fuller knowledge of the existing or potential distribution of pollutants in marine organisms. (Ensign-PAI)
W73-09649

PLUTONIUM AND POLONIUM INSIDE GIANT BROWN ALGAE,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05C.
W73-09652

THE VARIATIONS IN THE DISSOLVED OXYGEN AND TOTAL PHOSPHORUS CONCENTRATIONS IN LAKE GENEVA DURING THE YEARS 1969 AND 1970 (IN FRENCH),
Societe Vaudoise des Sciences Naturelles, Lausanne (Switzerland).
Pierre Revelly.
Bull Soc Vaudoise Sci Nat. Vol 71, No 4, p 211-215, 1972.. English summary.
Identifiers: *Dissolved oxygen, *Lake Geneva, Oxygen, *Phosphorus, Switzerland, Seasonal.

Resultsol analytical tests on the water of lake Leman Switzerland for the years 1968-1970 show a sudden increase in total P and dissolved O2 in the lower layers. However, it cannot yet be concluded that this variation is characteristic of the evaloution of the lake as a whole.--Copyright 1972, Biological Abstracts, Inc.
W73-09653

THE OCCURRENCE, LIFE CYCLE, AND PATHOGENICITY OF ECHINURIA UNCINATA (RUDOLPHI, 1819) SOLOVIEV, 1912 (SPIRURIDA, NEMAT ODA) IN WATER FOWL AT DELTA, MANITOBA,
Naval Medical Research Inst., Bethesda, Md.
For primary bibliographic entry see Field 02I.
W73-09749

5C. Effects of Pollution

THE EIGHTEENTH INTERNATIONAL LIMNOLOGY CONGRESS AT LENINGRAD (XVIII MEZHDUNARODNYY LIMNOLOGICHESKIY KONGRESS V LENINGRADE),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02H.
W73-09159

PHOTOSYNTHETIC PROPERTIES OF PERMEAPLASTS OF ANACYSTIS,
Texas Univ., Austin. Dept. of Botany; and Texas Univ., Austin. Dept. of Zoology.
B. Ward, and J. Myers.
Plant Physiology, Vol 50, No 5, p 574-550, 1972. 3 fig, 1 tab, 17 ref. NIH GM 11300.

Descriptors: *Cytological studies, *Photosynthesis, Plant physiology, Plant morphology, Algae.
Identifiers: *Permeaplstts, *Anacystis nidulans, Electron transport.

For preparation of photosynthetic procaryotic cells, functionally analogous to chloroplasts of eucaryotes, a procedure using lysozyme and EDTA reproducibly gives intact but permeable cells (permeaplasts) of Anacystis nidulans with isolated photosystems 1 and 2 of high ability (although with lowered rates) of complete photosynthesis. Rates of electron transport from water to carbon dioxide, ferricyanide, 2, 6-dichlorophenol indophenol, benzoquinone, and methyl viologen, and from reduced indophenol to methyl viologen were measured as a function of treatment time. Oxygen evolution rates in complete photosynthesis and electron flow from water to methyl viologen showed rapid and parallel decline with time. Electron flow from water to ferricyanide and from reduced indophenol to methyl viologen increased during the first half hour (phase 1) to 60 to 80% of original photosynthetic rate. Longer treatment (phase 2) resulted in decreased ferricyanide reduction rate but not in rate of methyl viologen reduction from indophenol. Electron flow from water to quinone was two to three times higher than for complete photosynthesis in intact cells remaining high during phase 1 and declining during phase 2. Phase 1 permeaplasts apparently retain high activity for photosystems 1 and 2 photoreactions. (Jones-Wisconsin)
W73-09171

BLOOMS OF SURF-ZONE DIATOMS ALONG THE COAST OF THE OLYMPIC PENINSULA, WASHINGTON. I. PHYSIOLOGICAL INVESTIGATIONS OF CHAETOCEROS ARMATUM AND ASTERIONELLA SOCIALIS IN LABORATORY CULTURES,
Washington Univ., Seattle. Dept. of Oceanography.
J. Lewin, and D. Mackas.
Marine Biology, Vol 16, No 2, p 171-181, 1972. 14 fig, 7 ref. NSF GB7373

Descriptors: *Adaptation, *Marine algae, *Plant physiology, *Coasts, *Diatoms, Cultures, Light intensity, Nutrients, Temperature, Salinity, Growth rates, Iron.
Identifiers: *Surf zone, *Chaetoceros armatum, *Asterionella socialis.

Virtually all plant biomass in the surf zone along the Olympic Peninsula, Washington, consists of two diatoms, Chaetoceros armatum and Asterionella socialis, which were isolated, grown in culture, and their physiological behavior studied. A. socialis displayed the greater maximum growth rate. Both species tolerated a wide range of salinities and temperatures and were favored by aeration. In response to increasing light intensity, C. armatum reached its maximum growth rate at 750 to 1000 lux (at 13C) whereas A. socialis only reached its maximum at 4000 lux. In its natural habitat, C. armatum is far the most important of the two, since its blooms often consist of almost pure stands. A mucilage envelope, with its accompanying clay particles, is invariably present surrounding C. armatum chains in their natural habitat, but the diatom did not produce this envelope under any culture conditions. The absence of the mucilage envelope (and clay particles) may explain the iron nutrition peculiarities observed in culture experiments, that is, a dependence on iron as NaFe-EDTA or ferric citrate, and failure to utilize ferric chloride as a source of Fe for growth. (Jones-Wisconsin)
W73-09172

PRODUCTION OF CARBOHYDRATES BY THE MARINE DIATOM CHAETOCEROS AFFINIS VAR. WILLEI (GRAN) HUSTEDT. I. EFFECT OF THE CONCENTRATION OF NUTRIENTS IN THE CULTURE MEDIUM,
Norwegian Inst. of Seaweed Research, Trondheim.
S. Myklestad, and A. Haug.
Journal of Experimental Marine Biology and Ecology, Vol 9, No 2, p 125-136, 1972. 7 fig, 6 tab, 16 ref.

Descriptors: *Cytological studies, *Plant physiology, *Carbohydrates, *Marine algae, Diatoms, Nutrients, Cultures, Chemical properties, Nitrates, Proteins, Phosphates, Fjords.
Identifiers: *Chaetoceros affinis, Glucan, Polysaccharide, Trondheimsjord (Norway).

Influence of the concentration of nitrate and phosphate on the chemical composition of the marine diatom, Chaetoceros affinis var. willei was studied, particularly production of carbohydrates, not only total amounts, but also amounts of glucan and of extracellular polysaccharide. The diatom, collected from the Trondheimsjord, was isolated from an enrichment culture and made bacteria-free by treatment with antibiotics. Chemical changes with age of the culture were followed. The cells' chemical composition was markedly influenced by nutrient concentration in the medium. In the logarithmic growth phase the cellular glucan content was relatively low, but in the stationary phase the glucan content showed a rapid increase which seemed to coincide with depletion of nitrate from the medium, which in turn led to very pronounced variations in the ratio of protein to carbohydrate. This ratio can easily be determined and seems to be a sensitive and convenient parameter for characterizing physiological state of the diatom cells. It is evident that the extracellular polysaccharide which was produced in the stationary phase, especially in a medium with a high proportion of nitrate to phosphate, accounts for a considerable part of the total cell production. (Jones-Wisconsin)
W73-09173

OCCURRENCE OF FREE AMINO ACIDS IN POND WATER,
Polish Academy of Science, Krakow. Zaklad Biologii Wod.
J. Zygmuntowa.
Acta Hydrobiologica, Vol 14, No 1, p 317-325, 1972. 3 fig, 1 tab, 36 ref.

Descriptors: *Amino acids, *Ponds, *Organic matter, Fish farming, Hypolimnion, Temporal distribution, Epilimnion, Indicators, Eutrophication, Chromatography.
Identifiers: Fish ponds, Cystine, Aspartic acid, Serine, Glutamic acid, Valine, Leucine, Alanine, Tyrosine, Tryptophan, Methionine, Proline, Lysine, Arginine, Threonine, Phenylalanine.

Free amino acid content in pond water was studied to check the qualitative and quantitative variations at various depths and times of day. Samples were taken from similar carp breeding ponds, differing only in amount of foodstuffs supplied to the fish. Temperature, oxygen content, and hydrogen ion concentration were determined. Besides the chemical analysis, the qualitative composition of phytoplankton was determined as the variations in the content of free amino acids on the surface and at the bottom seemed to correspond with the vertical migration of the phytoplankton. The thin-layer-chromatographic method proved successful because it permits the identification of substances in a relatively small amount of the basic sample. Appearing most frequently were: cystine, aspartic acid, serine with glycine, glutamic acid, alanine, valine, and leucine. There seemed to be accumulation of free amino acids at the bottom in the morning indicating sinking of organic matter and a decomposition process taking place. The concentration of free amino acids dissolved in pond water depends, to a certin extent, on the fertility of the pond, the time of day, and the layer in the vertical section. The content of free amino acids in waters of a similar type may reflect their fertility. (Jones-Wisconsin)
W73-09174

WATER QUALITY SIMULATION MODEL,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. Green, M.D.
Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 98, Nd SA4, p 669-670,1972. 2 ref.

Descriptors: *Equations, *Mathematical models, *Simulation analysis, Reaeration, Biochemical oxygen demand, Hydraulic properties, Streamflow, Dissolved oxygen.
Identifiers: Sensitivity analysis, Great Britain.

The mathematical model presented by Grantham, Schaake and Pyatt (See W71-13978) appears to have a number of inadequacies and a more accurate representation, describing a natural process subject to variation, is suggested. A daily pollution model was developed for a river system in Great Britain where there is a single effluent discharge point at the top end of a reach and the critical DO level within the reach is printed out for each time increment. This model was used to carry out a sensitivity test for each of the input parameters. First, the sensitivity of the daily critical DO level within the reach, averaged over four years, using a synthetic input, was determined with respect to changes in the mean value of each input parameter. Second, the sensitivity of the system in terms of the change in the standard deviation of the output was measured by changing the standard deviation of the inputs. Two important points regarding the application of the results of a sensitivity study are significant: First, the results of a sensitivity analysis are only applicable to a particular system or to systems that are close to the original; secondly, a sensitivity study can be used to guide further fieldwork. (Jones-Wisconsin)
W73-09175

WISCONSIN LAKES RECEIVING SEWAGE EFFLUENTS,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05B.
W73-09176

ATMOSPHERIC CONTRIBUTIONS OF NITROGEN AND PHOSPHORUS,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05B.
W73-09177

DDT AND MALATHION: EFFECT ON SALINITY SELECTION BY MOSQUITOFISH,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
D. J. Hansen.
Trans Am Fish Soc. Vol 101, No 2, p 346-350. 1972. Illus.
Identifiers: *DDT, *Malathion, *Mosquitofish, Salinity.

It is believed that salinity selection by test mosquitofish (Gambusia affinis) is probably the combined result of their preferences as wild fish, effects of acclimation salinity and effects of the pesticide.--Copyright 1973, Biological Abstracts, Inc.
W73-09178

EMERSON ENHANCEMENT OF CARBON FIXATION BUT NOT OF ACETYLENE REDUCTION (NITROGENASE ACTIVITY) IN ANABAENA CYLINDRICA,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
R. L. Lyne, and W. D. P. Stewart.
Planta (Berl.), Vol 109, No 1, p 27-38, 1973. 2 fig., 6 tab, 35 ref.

Descriptors: *Nitrogen fixation, *Carbon, *Anabaena, Photosynthesis, Enzymes, Aerobic conditions, Light intensity, Anaerobic conditions, Chlorophyll, Inhibition, Algae.
Identifiers: *Carbon fixation, *Emerson enhancement, *Anabaena cylindrica, ATP, Photophosphorylation.

Photostimulation of nitrogenase activity in Anabaena cylindrica was investigated by comparing the effects of supplying light primarily absorbed by photosystem 1 or photosystem 2 on carbon fixation and nitrogenase activity (measured as acetylene reduction) under aerobic and anaerobic conditions. Particular attention was paid to determining whether there was an Emerson enhancement of either process under suitable conditions. Whether there was competition between carbon fixation and acetylene reduction under light limited conditions was also investigated. Under identical conditions no enhancement of acetylene reduction was observed. Light absorbed by photosystem I supported relatively more acetylene reduction than carbon fixation. No competition between the two processes was observed under light-limiting conditions. The findings suggest that carbon fixation and acetylene reduction may depend on different pools of reductant and ATP. When aerobically grown cells were placed in the dark or at limiting light intensities, acetylene reduction was higher in air than under argon; in contrast, carbon fixation was lower in air than in argon. These results are interesting in that oxygen inhibition was found at a bicarbonate concentration that should saturate photosynthesis and that inhibition increased with decreasing light intensity. (Jones-Wisconsin)
W73-09180

SOLAR RADIATION, WATER TEMPERATURE AND PRIMARY PRODUCTION IN CARP PONDS,
Polish Academy of Sciences, Golysz. Zaklad Biologii Wod.
M. Szumiec.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 175-187, 1971. 4 fig, 4 tab, 13 ref.

Descriptors: *Solar radiation, *Water temperature, *Primary productivity, Fish farming, Ponds, Deep water, Energy dissipation, Time, Fertility, Photosynthesis, Mathematical studies, Seasonal.
Identifiers: Golysz (Poland).

Productivity of ponds at the Experimental Farm, Golysz, Poland, was surveyed to establish the influence of radiation intensity upon water temperature and primary production. Monthly mean water temperatures, sunshine duration, radiation energy, and their deviations from mean values over many years were recorded. A linear relation was found between the changes of water temperature and radiation intensity. A proportionate relation was found between the vertical gradients of temperature and radiation in the fertilized and control ponds where a correlation between primary production and solar radiation intensity was observed. An increase of primary production in the surface layer during the first half of the season caused a remarkable decrease of radiation penetration to the deeper layers. As a result the fertilized ponds' production changed in an approximately linear manner with the amount of solar energy. The mean values of radiation intensity during the whole season are a factor controlling primary production. The vertical change of radiation intensity, water temperature and primary production can be represented roughly as ex-

ponential functions. Solar energy utilization in primary production was limited to a few tenths of a percent while this energy in thermal changes amounted to a few percent. (Jones-Wisconsin)
W73-09181

SOME CHEMICAL FACTORS AND PRIMARY PRODUCTION OF PHYTOPLANKTON IN FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zakland Biologii Wod.
S. Lewkowicz, and S. Wrobel.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 180-201, 1968. 4 fig, 5 tab, 13 ref.

Descriptors: *Eutrophication, *Chemical properties, *Primary productivity, *Phytoplankton, Fish hatcheries, Temperature, Fertilization, Phosphorus, Nitrogen, Nutrients, Soils, Carbon, Primary productivity, Organic matter.
Identifiers: Golysz (Poland).

The influence of phosphorus and of phosphorus + nitrogen fertilizers upon primary production of phytoplankton and upon chemical conditions in the experimental ponds of Golysz, Poland, was investigated in 1967. The pond soils were studied both before filling with water and after three years of exploitation, with oxygen content fluctuations recorded under the different fertilizations. Similar algal communities were found in the ponds with Cyanophyta prevailing in August. Mean chlorophyll content in water of the superphosphate fed pond was four times larger than in the unfertilized pond, while in the phosphorus + nitrogen fed pond it was only 4.5 times larger than in the control. Timing of maximum productivity differed between the control and phosphorus-fertilized pond on one hand, and the phosphorus + nitrogen fertilized pond on the other. The hypothesis is confirmed that nitrogen demand, or the influence of nitrogen upon productivity, depends on physical factors, and most of all upon temperature. In general remarkable effects of phosphorus fertilization upon phytoplankton production were found: an addition of phosphorus + nitrogen fertilizer caused only a small primary production increase as compared with phosphorus alone. Phytoplankton made use of only 8% of the supplied phosphorus. (Jones-Wisonsin)
W73-09182

PHYTOPLANKTON OF FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zakland Biologii Wod.
L. Krzeczkowska-Woloszyn.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 203-214, 1971. 1 fig, 1 tab, 32 ref.

Descriptors: *Phytoplankton, *Fish hatcheries, *Eutrophication, Systematics, Biomass, Fertilization, Primary productivity, Plankton, Phosphates, Ammonia, Nitrates, Seasonal, Chlorophyta, Euglenophyta, Cyanophyta, Dinoflagellates, Chrysophyta, Anabaeana, Chlamydomonas.
Identifiers: Golysz (Poland), Volvocales, Chlorococcales, Bacillariophycea, Nannoplankton.

Qualitative and quantitative phytoplankton composition in fingerling carp ponds on the Experimental Farm, Golysz, Poland, is reported and where the algal cell surface in relation to the type of fertilization was measured. Three fingerling ponds--a control, one fertilized with superphosphate, and one fertilized with ammonium nitrate and superphosphate--were studied. As a rule, Chlorophyta, Cyanophyta, and Euglenophyta were the most numerous phytoplankton constituents. A list of the species and varieties found is included. In the control pond, small amounts of algae were recorded, whereas, in the others, fertilization positively influenced the amounts and surfaces of phytoplankton, indicating a polytrophic character of these ponds. A relationship between the species composition and amount of algae and type of fertilization was confirmed. It seems that biological analyses by no means always strictly correspond with chemical analyses, which sometimes leads even to different classifications of reservoirs. It is probable that the age of the ponds was the factor underlying the plankton composition as the type of succession observed was characteristic during the first years of the filling of the ponds. (Jones-Wisconsin)
W73-09183

BIOMASS OF ZOOPLANKTON AND PRODUCTION OF SOME SPECIES OF ROTATORIA AND DAPHNIA LONGISPINA IN CARP PONDS,
Polish Academy of Sciences, Golysz. Zaklad Biologii Wod.
M. Lewkowicz.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 215-223, 1971. 4 fig, 3 tab, 17 ref.

Descriptors: *Biomass, *Zooplankton, *Productivity, Rotifers, Daphnia, Fish hatcheries, Fertilization, Nitrogen, Phosphorus, Temperature, Crustaceans, Copepods.
Identifiers: *Rotatoria, *Daphnia longispina, Golysz (Poland), Polyarthra trigla vulgaris, Brachionus calyciflorus, Filinia longiseta, Cyclops.

Relationship of fertilization to zooplankton biomass and production of Rotatoria species and of Daphnia longispina was assessed at the Experimental Farm at Golysz, Poland, June 28-October 9, 1967 in three fingerling carp ponds which were unfertilized, fertilized with nitrogen + phosphorus, and fertilized with phosphorus alone. Fertilization increased zooplankton biomass. In the pond fertilized with nitrogen + phosphorus, zooplankton developed more rapidly than in the pond fertilized with phosphorus only. Rotatoria production in the fertilized ponds was several times greater than in the unfertilized. Production of Brachionus calyciflorus was found to be the highest in the pond fertilized with nitrogen + phosphorus. A particularly large production increase under the influence of fertilization was found in Polyarthra trigla vulgaris, Brachionus calyciflorus, and Filinia longiseta. Production of Daphia longispina in the fertilized ponds was much higher than in the unfertilized, the highest production always observed after a rapid decline of organic matter. No large differences between seasonal production in the pond fertilized with nitrogen + phosphorus and in that fed with phosphorus alone were found. Immediately after filling the unfertilized pond, Daphnia longispina appeared on a mass scale, perhaps associated with intensive destruction processes occurring on the bottom. (Jones-Wisconsin)
W73-09184

CILIATA IN BOTTOM SEDIMENTS OF FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
E. Grabacka.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 225-233, 1971. 2 fig, 1 tab, 8 ref.

Descriptors: *Protozoa, *Bottom sediments, Fish hatcheries, Eutrophication, Fertilization, Nitrogen, Phosphorus, Productivity, Daphnia, Systematics.
Identifiers: *Ciliates, Golysz (Poland), Coleps hirtus, Loxocephalus.

Ciliata are detritus feeders contributing much to organic matter reduction on bottom mud and are an element in the food chain. The development of Ciliata (mainly bacteriophagous) populations in bottom mud of fingerling ponds was investigated as part of a survey at the Experimental Farm, Golysz, Poland. The ponds were unfertilized, fertilized with phosphorus supplied in superphosphate, and fertilized with phosphorus and nitrogen, supplied in Norway saltpetre and superphosphate. The number of Ciliata species was rather small and the percentage of occurrence in all samples was computed for each species; quantitative dynamics in the ponds varied. The richest microfauna developed in the pond fertilized with nitrogen and phosphorus, in contrast to the pond fertilized with phosphorus only, and the control, where the amounts of Ciliata were markedly smaller. A marked increase in Ciliata numbers, particularly Coleps hirtus and Loxocephalus was observed soon after the maximum production in plankton, that is, during increased sinking of these crustacean organic remnants to the bottom, which was most remarkable in the pond fertilized with nitrogen and phosphorus. Ciliata feeding basically on bacteria prevailed while those feeding on algae were in the minority. (Jones-Wisconsin)
W73-09185

PRODUCTION OF MACROBENTHOS IN FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
J. Zieba.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 235-246, 1971. 1 fig, 2 tab, 17 ref.

Descriptors: *Diptera, *Productivity, Benthos, *Eutrophication, Fish hatcheries, Phosphates, Ammonia, Nitrates, Biomass Larvae.
Identifiers: Golysz (Poland).

As part of a survey on productivity of new ponds at the Experimental Farm, Golysz, Poland, production of benthos biomass in three ponds--control, fertilized with phosphorus, and fertilized with phosphorus + nitrogen--was estimated. For comparability of data, each pond was stocked equally with fish. Among the most abundant larvae in the macrobenthos were Chironomus f.l. thummi and Ch. f.l. plumosus while Glyptotendipes ex gr. gripekoveni were less numerous; Chironomus larvae formed nearly 100% of the total community biomass. Soon after the ponds were filled, an abundance of Chironomus f.l. thummi appeared. After a few weeks, the large form, Chironomus f.l. plumosus, prevailed in fertilized ponds for a longer period than in the control. Highest production of Chironomus f.l. thummi and of total benthos production was recorded in the nitrogen + phosphorus fertilized pond. Larvae developed mainly on food from decomposed water plants on the bottom. The influence of fertilization was expressed in the occurrence of the second predominant species, Ch. f.l. plumosus. In the phosphorus fertilized and in the control ponds, biomass production values were similar. The production/biomass coefficient was lowest in the phosphorus + nitrogen fertilized pond and highest in the control. (Jones-Wisconsin)
W73-09186

BIOMASS AND PRODUCTION OF CARP FRY IN DIFFERENTLY FERTILIZED FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
J. M. Wlodek.
Polskie Archiwum Hydrobiologii, Vol 18, No 2, p 247-264, 1971. 7 fig, 4 tab, 10 ref.

Descriptors: *Biomass, *Fry, *Productivity, *Fish hatcheries, Carp, Fertilization, Animal growth, Mathematical models, Nitrogen, Phosphorus, Phosphates, Mortality, Fish management, Fish reproduction.
Identifiers: Golysz (Poland).

The influence of mineral fertilization of ponds at the Experimental Farms, Golysz, Poland, was estimated during the vegetation season of 1967, and a mathematical model for fish survival

developed. Variability of fish weight and its correlation with production were also studied. Twelve ponds were investigated using four unfertilized controls, four fertilized with phosphorus, and four fertilized with nitrogen + phosphorus in the form of superphosphate and Norway saltpetre. Biomass was calculated on the basis of fish measurements from random samples and on the basis of the hypothetical densities of the sampled populations. Density was calculated at the time of sampling taking alternative seven elementary mathematical functions as a regularity in mortality; therefore the changes in the biomass with time were represented by clusters of curves. The greatest biomass and greatest production were observed in the nitrogen + phosphorus fertilized ponds. Time variability of five biometrical features was also examined by means of the coefficients of variation. In the unfertilized ponds there was found a high and statistically significant negative correlation between production and relative variability. There was a statistically significant fertilization influence on the individual fish growth in weight. (Jones-Wisconsin)
W73-09187

STUDIES ON CULTURAL PROPERTIES OF PLANKTONIC, BENTHIC AND EPIPHYTIC BACTERIA,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
E. Strzelczyk, W. Donderski, and A. Mielczarek.
Zeszyty Naukowe Uniwersytetu Mikolaja Kopernika, Nauki Matematyczno-Przyrodnicze, Zeszyt 28 (Limnological Paper No 7), p 3-12, 1972. 6 tab, 16 ref.

Descriptors: *Cultures, *Bacteria, *Plant growth, Plankton, Benthos, Aquatic bacteria, Biochemistry, Biological communities, Plant morphology, Carbon, Nitrogen, Habitats, Distribution.
Identifiers: *Epiphytic bacteria, Heterotrophic bacteria, Lake Jeziorak (Poland).

Heterotrophic bacterial morphology was studied in cultures derived from samples of surface waters, mud, and Canadian pondweed, which were grown in liquid iron pepton medium. Ability of bacteria to utilize various carbon compounds, growth at various temperatures, the effect of pH on growth, and comparative bacterial growth were analyzed. Bacteria inhabiting bottom deposits differ from those occurring in water and on the surface of submersed plants in regard to morphology and nutrition. Gram negative rods predominate amond epiphytic bacteria while among mud bacteria, the predominant types were pleomorphic forms (Coryne-bacterium, Arthrobacter, and Nocardia). The epiphytic bacteria show best growth in the presence of organic nitrogen whereas the majority of water and mud isolates respond almost equally to mineral nitrogen (ammonium nitrogen). A wide range of carbon compounds was utilized by the bacterial isolates studied. The largest number of slow growing bacteria was found among the mud isolates. Optimal temperatures were 26C for the epiphytic isolates and 20C for the mud and water isolates. Bacteria developed well over pH 5.5-9, however pH 7 was optimal for most isolates derived from all sources mentioned. (Jones-Wisconsin)
W73-09188

THE HORIZONTAL DIFFERENTIATION OF THE BOTTOM FAUNA IN THE GOPLO LAKE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
A. Gizinski, and S. Kadulski.
Zeszyty Naukowe Uniwersytetu Mikolaja Kopernika, Nauki Matematyczno-Przrodnicze, Zeszyt 28 (Limnological Paper No 7), p 57-76, 1972. 1 fig, 5 tab, 21 ref.

Descriptors: *Systematics, *Benthic fauna, Habitats, Lakes, Oligochaetes, Spatial distribution, Distribution, Diptera, Mollusks, Water pollution effects, Profundal zone.
Identifiers: *Goplo Lake (Poland), Dreissena polymorpha, Asellus aquatcus, Chaoborus.

General characterization of bottom fauna of Goplo Lake, Poland, especially considering horizontal qualitative and quantitative benthic composition, is given. An attempt is made to establish to what degree samples, taken at a particular location, may be representative of bottom fauna of the whole lake to support findings regarding faunistic typology. Lake Goplo's trophic level is intermediate, between the oligo--and mezo-plumosus-Chaoborus type. The environmental and faunistic character of 14 stations are given. At stations along the longest axis a steady increase of the relative quantity of Chironomus f.l. plumosus larvae were found. The percent of Oligochaeta and Chaoborus larvae decreased as they did also in proportion to the proximity to the town of Kruszwica while Chironomus plumosus larvae tended to increase. The station at the town showed the poorest fauna, both qualitatively and quantitatively due to industrial and communal pollution. The most representative profundal fauna, qualitatively and quantitatively, were found at a depth approaching the maximum but in another part of the lake. The station with the abundant Einfeldia ex gr. carbonaria larvae showed the highest coefficient of difference from the other midlake stations. (Jones-Wisconsin)
W73-09189

ZOOPLANKTON OF THE BAY PART OF GOPLO LAKE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
A. Adamska, and D. Bronisz.
Zeszyty Naukowe Uniwersytetu Mikolaja Kopernika, Nauki Matematyczno-Przyrodnicze, Zeszyt 28 (Limnological Paper No 7), p 39-55, 1972. 4 fig, 4 tab, 24 ref.

Descriptors: *Zooplankton, *Shallow water, *Lakes, *Systematics, Dominant organisms, Ecological distribution, Spatial distribution, Crustaceans, Copepods, Rotifers, Seasonal.
Identifiers: *Goplo Lake (Poland).

Qualitative and quantitative zooplankton compostion in the eutrophic bay of Goplo Lake, Poland, were examined and are classified. The most important species, horizontal and vertical distribution of Cladocera, Copepods, and Rotatoria, periodic fluctuations in composition, numbers and distribution, and numbers and proportionate share of Rotatoria, Cladocera, and Copepoda during a year's cycle are delineated. A description of the lake and the various stations with temperature, transparency, and oxygen content is given. Copepoda predominate (average number of individuals 3763/10 l). The second place belongs to Rotatoria (21 species, 3602 individuals/10 l). Cladocera occur less numerously (1182 individuals/10 l), but they are the richest in species and are represented by 34 species. Populations differed between the pelagic stations near the East Notec River, which flows through the lake, and the stations containing aquatic vegetation. Noticeable differences of zooplankton were found in various layers, with the most abundant in the surface and near the bottom. The maximum growth of Rotatoria and Cladocera in summer was recorded. Seasonal fluctuations of Copepoda differ at various stations. (Jones-Wisconsin)
W73-09190

BOTTOM FAUNA OF THE BAY PART OF GOPLO LAKE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
A. Gizinski, and E. Toczek-Boruchowa.
Zeszyty Naukowe Uniwersytetu Mikolaja Kopernika, Nauki Matematyczno-Przyrodnicze, Zeszyt 28 (Limnological Paper No 7), p 77-93, 1972. 1 fig, 4 tab, 11 ref.

Descriptors: *Benthic fauna, *Shallow water, *Lakes, Habitats, Seasonal, Eutrophication, Systematics, Baseline studies, Oligochaetes, Environmental gradient, Diptera, Mollusks.
Identifiers: *Lake classification, Ephemeroptera, Hirundenea.

Continuing studies of shallow, extremely eutrophic lakes, the bay of Goplo Lake, Poland, is a pond type and classified according to the fauna of its deeper parts as oligo--or mesoplumosus-Chaoborus type, was investigated. The general characterization of the bottom fauna habitats, with the list of fauna, are given together with the dynamics of seasonal fluctuations in composition (qualitative and quantitative). Prevailing forms at littoral stations and at deeper stations, similar to profundal, are listed. January proved to be the best period for taking samples which are representative of the fauna. The profundal samples taken that month showed the greatest similarity to the average estimated on a base of samples taken during the whole year. The greatest divergence from the average was shown in samples taken just before freezing of the lake and just after retreat of the ice cover. Increase in fauna numbers occurred at the shallower stations at the beginning of the freeze suggesting the possibility of development from eggs or from younger larval states, smaller 0.5 mm, in winter. (Jones-Wisconsin)
W73-09191

THE BOTTOM FAUNA OF THE WATER RESERVOIRS WHICH NEWLY CAME INTO THE NEIGHBOURHOOD OF THE KORONOWO DAM RESERVOIR,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Hydrobiology.
A. Gizinski, and A. Paliwoda.
Zeszyty Naukowe Uniwersytetu Mikolaja Kopernika, Nauki Matematyczno-Przyrodnicze, Zeszyt 28 (Limnological Paper No 7), p 97-108, 1972. 2 fig, 5 tab, 15 ref.

Descriptors: *Benthic fauna, *Ponds, *Systematics, Diptera, Habitats, Environmental gradient.
Identifiers: *Koronowo Reservoir (Poland), Brda River (Poland), Chaoborus, Tendipes, Tanytarsus.

In damning the Brda River, Poland, for the new Koronwo Reservoir in 1960-1962, small, permanent water basins were formed in ground depressions. The fauna of some of these basins were examined, listed, and the dominant forms are described together with the physical features of the basins. Despite the fact that the basins were only recently formed (1961-1962) the bottom fauna was relatively rich in quality and quantity. During the fourfold sampling in the four seasons, 5392 specimens from 67 taxons were collected in 70 samples. The larvae of Chaoboridae and Chironomidae were the most abundant and the most frequently caught representatives of the benthos. Abundance of bottom fauna was quite varied in the different habitats and at various times. The great variability at the same stations during the year proves the unstabilized, yet, environmental and biocenotic conditions. Only the eurytopic forms, such as the larvae of the Chaoborus and Chironomus genera, occurred in relatively constant and large numbers. The ecologic conditions, typical of 'old' basins, may be stabilized in several years when a stratum of mud will be deposited at the bottom. (Jones-Wisconsin)
W73-09192

EFFECT OF THE CHEMICAL COMPOSITION OF THE MEDIUM ON THE GROWTH OF CHLORELLA PYRENOIDOSA,
Instytut Zootechniki, Oswiecim (Poland). Samodzielna Pracownia Biologii Ryb i Strodowiska Wodnego.

J. Zarnowski.
Acta Hydrobiologica, Vol 14, No 3, p 215-223, 1972. 1 fig, 4 tab, 18 ref.

Descriptors: *Algae, *Cultures, *Chemical properties, *Plant growth, Chlorella, Biomass, Ureas.
Identifiers: *Chlorella pyrenoidosa, *EDTA, Tamiya medium.

The growth intensity of Chlorella pyrenoidosa on several media, selected from the available literature, was observed and the effect of different EDTA concentrations in the medium on the rate of growth of algal cultures, measured by the number of cells in 1 ml and by the weight of dry matter, was investigated. Each medium was used in four combinations: ethylenediaminetraacetic acid (EDTA) without and with 7, 37, and 100 mg of EDTA in 1 liter of the culture. The temperature ranged from 19 to 22C. Each combination was carried out in five replications. Results of growth on 16 mineral media are tabulated. Results of utilization of basic mineral nutrients, nitrogen, phosphorus, and potassium are also presented suggesting that degree of utilization of different compounds is variable. The greatest increases in biomass were obtained on the media containing complex compounds: EDTA and sodium citric, besides the mineral macro- and micro-elements. The greatest amounts of nutrient were utilized by the algal culture on the Tamiya medium. The additions of EDTA at a rate of up to 100 mg/l of the medium stimulated the growth of the alga. (Jones-Wisconsin)
W73-09193

FIXATION OF ATMOSPHERIC NITROGEN BY AZOTOBACTER SP., AND OTHER HETEROTROPHIC OLIGONITROPHILOUS BACTERIA IN THE ILAWA LAKES,
Wyzsza Szkola Rolnicza, Olsztyn-Kortowo (Poland). Instytut Inzynierii i Biotechnolgii Zywnosci.
S. Niewolak.
Acta Hydrobiologica, Vol 14, No 3, p 287-305, 1972. 8 fig, 3 tab, 33 ref.

Descriptors: *Nitrogen fixation, *Azotobacter, *Nitrogen fixing bacteria, *Lakes, Bottom sediments, Distribution, Water pollution, Seasonal, Plankton, Pseudomonas, Clostridium, Eutrophication, Limiting factors.
Identifiers: *Ilawa Lakes (Poland), Azotobacter beijerinckii, Aeromonas, Vibrio, Achromobacter, Flavobacterium, Corynebacterium, Clostridium pasteurianum, Aerobacter aerogenes.

The occurrence of bacteria fixing atmospheric nitrogen in water, bottom sediments, and netplankton of the Ilawa Lakes, Poland, especially strains recently isolated, the dynamics of their development in the annual cycle, and the intensity of molecular nitrogen fixed by them were studied. The choice of sampling points was determined by their distance from pollution sources and the character of the bottom. In the collected samples determinations were made of the number of bacteria of the genus Azotobacter fixing atmospheric nitrogen, the number of bacteria of the Pseudomonas-Achromobacter group, and Clostridium pasteurianum. Considerable differences were noted in the bacteria development, according to degree of pollution or mineralization of the water, season of the year, and type of the bottom. The greatest quantities of bacteria fixing atmospheric nitrogen occurred in the netplankton and in the bottom sediments. One maximum occurred in water and bottom sediments in May or June; and another in September and November. Azotobacter beijerinckii fixed the greatest quantity of atmospheric nitrogen in pure cultures. Yield of strains of Aeromonas, Vibrio, Achromobacter, Flavobacterium, and Corynebacterium was within the range typical of nitrogen fixing bacteria. (Jones-Wisconsin)
W73-09196

PSEUDOMONAS CYTOCHROME C PEROXIDASE. IV. SOME KINETIC PROPERTIES OF THE PEROXIDATION REACTION, AND ENZYMATIC DETERMINATION OF THE EXTINCTION COEFFICIENTS OF PSEUDOMONAS CYTOCHROME C-551 AND AZURIN,
Helsinki Univ. (Finland). Dept. of Biochemistry.
R. Soininen, and N. Ellfolk.
Acta Chemica Scandinavica, Vol 26, No 3, p 861-872, 1972. 8 fig, 3 tab, 29 ref.

Descriptors: *Pseudomonas, *Enzymes, *Pigments, *Biochemistry, Kinetics, Cytological studies, Aquatic bacteria.
Identifiers: *Cytochrome, Peroxydation reaction, Peroxidase, Hydrogen peroxide, Azurin.

Location in the cell and some physicochemical properties of the peroxidation reaction catalyzed by Pseudomonas cytochrome c peroxidase were studied previously. The kinetics of the reaction are now reported. The optimum pH of the peroxidation of Pseudomonas ferrocytochrome c-551 was found to be 6.0 and the optimum ionic strength 0.01 in sodium acetate and sodium phosphate buffers. Pseudomonas cytochrome c peroxidase reacts specifically with two Pseudomonas respiratory chain pigments, ferrocytochrome c-551 and reduced azurin. Horse heart ferrocytochrome c, yeast ferrocytochrome c, and conventional low molecular weight peroxidase substrates such as pyrogallol, guajacol, sodium ascorbate, ferrocyanide, and reduced 2,6 dichlorobenzenone-indo-3-chlorophenol were found to be poor donors in the peroxidation. Ethyl hydroperoxide could not replace hydrogen peroxide as an electron acceptor in the peroxidation reaction. Maximal turnover rates for Pseudomonas ferrocytochrome c-551 and reduced azurin were found. The extinction coefficients of the peroxidase substrates Pseudomonas cytochrome c-551 and azurin were determined enzymatically by the reaction catalyzed by Pseudomonas cytochrome c peroxidase. Values were obtained for cytochrome c-551 and for azurin. (Jones-Wisconsin)
W73-09198

COMPARATIVE STUDY OF THE LIMNOLOGY OF TWO SMALL LAKES ON ROSS ISLAND, ANTARCTICA,
California Univ., Davis. Div. of Environmental Studies; and California Univ., Davis. Inst. of Ecology.
Charles R. Goldman, David T. Mason, and Brian J. B. Wood.
In: Antarctic Terrestrial Biology, p 1-50. American Geophysical Union, Washington, D.C., 1972. 57 fig, 16 tab, 63 ref, 2 append.

Descriptors: *Limnology, *Lakes, *Antarctic, Lake Morphometry, Periphyton, Meteorology, Birds, Cyanophyta, Light penetration, Heat budget, Light intensity, Productivity, Conductivity, Seston, Temperature, Lake morphology, Winds, Solar radiation, Hydrogen ion concentration, Phosphates, Alkalinity, Benthos, Diatoms, Standing crop, Chemical analysis, Organic matter, Plant physiology, Plankton, Primary productivity, Water chemistry, Trace elements, Biology.
Identifiers: *Ross Island (Antarctica), McMurdo Sound (Antarctica).

Investigations of two small antarctic lakes on Ross Island, Cape Evans, Antarctica during the austral summers of 1961-1962 and 1962-1963 were directed toward energy flows through their unique physical and biological conditions with Algal and Skua lakes illustrating extreme conditions. Skua Lake is linked to productivity of the sea by avian (skua) fertilization and responds with seasonal phytoplanktonic blooms comparable to eutrophic temperate waters. The chemical characteristics of these lakes reflect proximity to the ocean and the kenyte lava surrounding them. Rates and efficiencies of productivity are remarkably similar, although benthic production is more important than planktonic. Solar heating of the benthos early in the season opens large productive areas before a truly planktonic community can exist. The overall plankton production and chlorophyll estimates indicate that Skua Lake is about eight times more productive than Algal Lake, whereas other sestonic crop estimates indicate that Skua Lake is only five times more productive, suggesting a greater portion of the total seston of turbid Skua Lake is actively producing, a phenomenon perhaps largely attributable to great light inhibition in the clear water of Algal Lake. (Jones-Wisconsin)
W73-09199

PROFILES OF CHLOROPHYLL CONCENTRATIONS BY IN VIVO FLUORESCENCE: SOME LIMNOLOGICAL APPLICATIONS,
Kinneret Limnological Lab., Tiberias (Israel).
T. Berman.
Limnology and Oceanography, Vol 17, No 4, p 616-618, 1972. 1 fig, 9 ref.

Descriptors: *Analytical techniques, *Chlorophyll, *Fluorometry, Phytoplankton, Distribution, Algae, On-site tests, Sampling, Vertical migration.
Identifiers: Lake Kinneret (Israel), Water column.

To ensure representative sampling, an in vivo fluorometric technique of chlorophyll-a sensing enables accurate and rapid delineation of vertical phytoplankton profiles. Work in Lake Kinneret, Israel, illustrates some potential limnological applications of this technique, especially in situations where microstratification or vertical patchiness of algae occur. This procedure leads to a rapid determination of important hetero-geneities in vertical algal distribtuion that are often missed by sampling at fixed depths and permits rational sampling for chemical and biological parameters. In addition to this primary exploratory function, continuous chlorophyll profiles can obviously provide valuable information on the amounts of this pigment in the water column. In Lake Kinneret, eight representative stations were monitored to follow the seasonal changes in total lake chlorophyll concentrations. During the peak of the winter-spring bloom, when more than 95% of the algal biomass consisted of Peridinium westii, fluorescence could be calibrated directly in cells/ml. In such cases, or where reasonable estimations of the ratio of algal carbon to chlorophyll are available, phytoplankton biomass carbon can be rapidly measured by fluorometry which can thus complement more exact, but exceedingly tedious, microscopic observations. (Jones-Wisconsin)
W73-09200

PHOSPHATE NUTRITION OF THE AQUATIC ANGIOSPERM, MYRIOPHYLLUM EXALBESCENS FERN.,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
D. O. Wilson.
Limnology and Oceanography, Vol 17, No 4, p 612-616, 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Phosphates, *Aquatic plants, *Plant growth, Nutrients, Aquatic weeds, Rooted aquatic plants.
Identifiers: *Myriophyllum exalbescens, Phosphorus storage, Watermilfoil.

In order to control and decrease the spread of watermilfoil in aquatic environments, the effect of external concentrations of inorganic phosphate on Myriophyllum exalbescens growth was evaluated. A vegetative sterilization method was developed by treatment with a sodium hypochlorite solution followed by rinses with sterile distilled water. A sufficiently high concentration of sodium hypochlorite for bleaching the leaves completely was necessary. Surface algae were killed and an algal-free axillary bud formed. The concentration and time of exposure to sodium hypochlorite de-

pended on size and age of the stem segment, but concentrations of 0.2-1.0% for 10 to 20 minutes were usually satisfactory. Growth and tissue phosphorus concentrations were measured in these algal-free plants grown in nutrient solutions with phosphate maintained at concentrations from 0.1 to 100 micromoles. No major growth differences were observed over 5 weeks. Tissue phosphorus concentrations (dry-wt basis) ranged from 0.062-1.38% with no apparent signs of phosphorus deficiency or toxicity. This species can store large quantities of phosphorus which it uses when external sources are low. It is apparent that lowering the phosphate concentration of the water would not be effective in controlling the spread of this aquatic angiosperm. (Jones-Wisconsin)
W73-09201

OCCURRENCE OF STEROLS IN THE BLUE--GREEN ALGA, ANABAENA-CYLINDRICA,
Kagoshima Univ. (Japan). Faculty of Fisheries.
S. Teshima, and A. Kanazawa.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 38, No 10, p 1197-1202, 1972. 1 fig, 2 tab, 15 ref.

Descriptors: *Biochemistry, *Anabaena, *Cytological studies, Enzymes, Cyanophyta, Algae.
Identifiers: *Anabaena cylindrica, Sterols.

Occurrence and origin of sterols in blue-green algae was studied, especially their composition and biosynthesis. Anabaena cylindrica was grown aseptically on a modified Detmer's medium containing only the salts and without sterols, from which sterols were isolated by the digitonin-precipitation method. Identification of sterols was performed by gas-liquid chromatography and mass spectrometry. They were composed of brassicasterol (90%), cholesterol (8%), 22-dihydrobrassicasterol (2%), and 22-dehydrocholesterol (less than 1%). The occurrence of sterols in A. cylindrica was further confirmed by the fact that the incubation of its cells with acetate-1-C14 gave radioactive squalene and sterols. The sterol content of A. cylindrica (0.253 mg/g of fresh cells) obtained in the present study was very high as compared with that of Phormidium luridum (0.03 mg/g of fresh cells) which was reported by earlier workers. This may be attributed to the discrepancy in extraction methods for sterols from the cells. There is almost no doubt that cells of blue-green algae as well as other algal cells contain sterols. (Jones-Wisconsin)
W73-09202

MECHANISM OF RESPIRATORY EXCHANGES IN AQUATIC ENVIRONMENT. A GENERAL REVIEW INCLUDING PERSONAL RESULTS,
Amiens Univ. (France). Laboratoire de Physiologie.
P. Harichaux, A. Poizot, and M. Freville.
Revue Internationale d'Oceanographie Medicale, Nice, Vol 27, p 71-84, 1972. 4 fig, 1 tab, 9 ref.

Descriptors: *Water pollution effects, *Chemical wastes, *Toxicity, Fish, *Respiration, Weight, Temperature, *Metabolism, *Oxygen, Phosphorus.
Identifiers: *Gardonus rutilus.

Respiratory exchanges in the aquatic environment are reviewed. A method for continuous measuring of PO2 and PCO2 variations in the aquatic environment of the fish is presented. This device computes oxygen consumption in relation to species weight, ambient temperature and the chemical factors of pollution. The method permits, among other things, the study of metabolic variations after artificial poisoning of the medium and also serves as a test of pollution (experiments conducted with 2-4 dinitrophenol provoked spontaneous death for a dose of 0.2 mg/ml of the bath.) It is assumed that the different metabolic conditions or the manner of supply of O2 in the blood explains the existing differences in the limiting values of PO2 of the medium which assures survival. (Ensign-PAI)
W73-09206

DISTRIBUTION OF POLYCHAETA IN POLLUTED WATERS,
Modena Univ. (Italy). Inst. of Zoology.
For primary bibliographic entry see Field 05B.
W73-09208

RESEARCH OF THE ORGANOCHLORINE PESTICIDES IN THE LITTORAL ENVIRONMENT (RECHERCHE DES PESTICIDES ORGANOCHLORES DANS LES MILIEUX LITTORAUX),
J. Fougeras-Lavergnolle.
Revue des Travaux de l'Institut des Peches Maritimes. Paris. Vol 35, No 3, p 367-371, October 1971. 1 fig, 1 tab, 8 ref.

Descriptors: *Littoral, *Oysters, *Chromatography, *Pesticide toxicity, *Pesticides, *Insecticides, Aldrin, Dieldrin, Heptachlor, DDE, DDT.
Identifiers: *Crassostrea angulata, Hexachlorocyclohexanes, TDE.

The effect of pesticides on oysters in the coastal zone was studied. The oyster tissue accumulated much higher concentrations of DDT than the surrounding waters. This concentration varied according to the concentration in the water, the temperature, and the exposure time, but was possible to reach a level of 70,000 times the environmental waters. If the concentration in the water was less than 0.002 ppm the oysters growth and behavior were normal. Crassostrea angulata, were used to test the insecticides hexachlorocyclohexanes, heptachlor, heptachlor epoxide, aldrin, dieldrin, DDE, DDT, and TDE. Analysis was done by chromatography. None of the insecticides heptachlor, heptachlor epoxide, aldrin and dieldrin were identified in the samples analysed. The hexachlorocyclohexanes and were found in all samples. (Ensign-PAI)
W73-09209

SEDIMENT, FISH, AND FISH HABITAT,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie.
Journal of Soil and Water Conservation, Vol 27, No 3, p 124-125, May-June 1972. 24 ref. AEC 49-7 (3029).

Descriptors: *Sediments, *Turbidity, *Aquatic life, *Fish populations, *Suspended solids, Water pollution, Environmental effects, Water pollution effects.
Identifiers: *Spawning grounds, Survival rates.

The effects of sediment and/or turbidity on aquatic ecosystems are discussed. Some of the areas briefly examined include changes in light penetration, reduction of oxygen in water, effects on survival rates of eggs and alevins, reduction in the number and kind of bottom organisms and alteration in the depth and duration of streamflow. Fish population changes are also described. Studies of turbidity have led to the conclusion that a definite relationship exists between the period of survival of fish and their exposure to high concentrations of suspended material. Sedimentation can destroy fish and oyster spawning grounds, as evidenced by the ruin of spawning grounds in the upper estuary of the Chesapeake Bay. This study maintains that quantitatively, sediment is the greatest single pollutant in U.S. waters. (Ensign-PAI)
W73-09213

TRAGEDY AT NORTHPORT,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Lab.
M. J. Silverman.
Bulletin of the American Littoral Society, Vol 7, No 2, p 15-18. 4 fig. Fall - 1971.

Descriptors: *Thermal pollution, Fish, *Water temperature, *Fish migration, Habitats, Water pollution effects, *Fishkill, *New York.
Identifiers: *Long Island Sound, *Bluefish (Pomatomus saltatrix).

The effect of the Northport, Long Island power plant discharge on the bluefish, Pomatomus saltatrix, is reported. Young bluefish migrating from Long Island Sound to warmer Atlantic waters encountered water warmed by the power plant discharge. The fish wintered in this artifically warmed habitat until gusting winds mixed the cold Sound water into the warmer water in the plant's discharge basin. It has been estimated that as many as 10,000 bluefish died from cold shock. The kill was the largest one known to have occurred at the power plant. (Ensign-PAI)
W73-09214

EFFECTS OF MAN'S ACTIVITIES ON ESTUARINE FISHERIES,
Florida State Univ., Tallahassee. Dept. of Oceanography.
R. W. Menzel.
Bulletin of the American Littoral Society, Vol 7, No 2, p 19-31. 6 fig. Fall - 1971.

Descriptors: *Estuaries, *Aquatic animals, Aquatic populations, *Water pollution effects, *Environmental effects, Dredging, Dams, Industrial wastes, Thermal pollution, *Sea basses, *Shrimps, *Oysters.
Identifiers: *Sea trout, Environmental changes.

Estuaries are described and discussed with respect to a variety of forms of environmental degradation. The slow but cumulative sub-lethal environmental changes that reduce organismic populations are explored. Dredging and filling, the damming of rivers, industrial effluents and thermal pollution are among topics examined. Some species of estuarine fauna are studied in light of the effects of pollution. Oysters, for instance, are susceptible to all types of pollution since they are sessile all their adult life. Results of various studies conducted on the effects of different kinds of pollution on oysters are summarized. Shrimp, spotted bass, and sea trout are also studied; current knowledge concerning population levels and pollution effects are presented for these organisms as well. (Ensign-PAI)
W73-09216

ANTIBIOTIC-RESISTANT COLIFORMS IN FRESH AND SALT WATER,
Alabama Univ., Birmingham. Medical Center.
For primary bibliographic entry see Field 05B.
W73-09218

INCREASING ORGANIC POLLUTION IN KINGSTON HARBOUR, JAMAICA,
University of the West Indies, Kingston (Jamaica). Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W73-09219

INFLUENCE OF VENEZUELAN CRUDE OIL ON LOBSTER LARVAE,
Guelph Univ. (Ontario). Dept. of Zoology.
P. G. Wells.
Marine Pollution Bulletin, Vol 3, No 7, p 105-106, July 1972. 7 ref.

Descriptors: *Oil wastes, *Toxicity, *Lobsters, *Bioassays, Laboratory tests, Larvae, Water pollution effects, *Lethal limit.

Identifiers: Venezuelan crude oil, Homarus americanus larvae.

Results of initial toxicity bioassays conducted on lobster larvae (Homarus americanus) subjected to sublethal to 10-day toxicity bioassay were conducted with four stages of larvae in varying concentration of seawater and crude oil at temperatures of 20-21 deg C. Emulsified Venezuelan crude oil was found to be rapidly lethal to larvae at 0.1 ml/l and may have sublethal effects at concentrations between 0.01 ml/l and 0.001 ml/l. (Ensign-PAI)
W73-09221

ECOLOGICAL EFFECTS OF DREDGED BORROW PITS,
Research and Ecology Projects, Inc., San Francisco, Calif.
J. F. Gustafson.
World Dredging, p 44-48, September 1972. 2 fig, 8 ref.

Descriptors: *Dredging, *Turbidity, *Water quality standards, *Regulation, Coasts, Harbors, Marine plants, Marine animals, Water pollution.
Identifiers: *Dredge spoil, *Ecological effects.

The charge that coastal and harbor dredging causes water pollution is examined. It is maintained that the criteria for pollution control developed by various state, local and federal agencies have been hastily conceived and are not valid standards in some cases. The role of turbidity in water pollution is reviewed and evidence is presented which indicates that turbidity can be ecologically beneficial. Effects of dredge spoil on marine organisms is also discussed. Two experimental projects involving dredging and the environment are proposed. Dredged borrow pits would be studied to demonstrate the specific fauna and flora enhancements which they provide in local marine areas. The second project would study the numbers and types of bottom organisms present in sample dredged areas 2, 3, 4, 5 or more years old; the study would determine the rate and degree of the reestablishment of life after dredging. (Ensign-PAI)
W73-09227

CLAMS FROM POLLUTED AREAS SHOW MEASURABLE SIGNS OF STRESS.

Maritimes, p 15-16, May 1972. 2 fig.

Descriptors: *Clams, *Organic compounds, Water pollution, Water pollution effects, *Rhode Island.
Identifiers: *Hardshell clams, *Mud-blisters, *Physiological abnormalities, Hydrocarbons, *Providence River (R.I.).

Hardshell clams in the Providence River exhibit stress symptoms linked to hydrocarbons and other organic compounds which are dumped into the River. Signs of stress in the clams include a change in the color of the meat, the development of a ridge on the inside edge of the shell, and a mud-blister infestation on the inner surface of the shell. Even when the diseased clams were kept in a clean environment for a year, the abnormalities remained. It appears that transplanting clams downbay from polluted areas to allow self-purification is not a viable solution. (Ensign-PAI)
W73-09235

ARSENIC INTOXICATION FROM WELL WATER IN THE UNITED STATES,
Minnesota Dept. of Health, Minneapolis.
For primary bibliographic entry see Field 05B.
W73-09248

INFANTILE METHEMOGLOBINEMIA CAUSED BY CARROT JUICE,
Saint Louis Children's Hospital, Mo.
J. P. Keating, M. E. Lell, A. W. Strauss, H. Zarkowsky, and G. E. Smith.
The New England Journal of Medicine, Vol 228, No 16, April 19, 1973, p 824-826. 1 tab, 19 ref.

Descriptors: Nitrogen, Nitrogen compounds, *Nitrites, *Nitrates, *Carrots, Reduction (Chemical), Toxicity, Fertilizers, Pollutants, Water pollution effects.
Identifiers: *Methemoglobinemia, Cyanosis, Health hazards.

A two-week old black male infant was found to have symptoms of methemoglobinemia after ingestion of fresh carrot juice. Analysis of similar carrots, of the same brand and bought at the same store as the suspect carrots, showed large amount of nitrate and nitrite present. It was calculated that the patient had ingested approximately 104 mg. of nitrite and 70 mg. of nitrate per kilogram (toxic effects may be expected if 2 mg. of nitrite per kilogram is ingested). Nitrate is a health hazard if conditions permit its reduction to nitrite, which when ingested, will cause methemoglobinemia. This potentially toxic reduction, in this case, occurred in the carrots after harvest without definite bacterial contamination. Studies in spinach suggest that plant reductases are responsible and that initial high nitrate content may be important to the reaction. The index carrots contained approximately 1300 ppm of nitrate at harvest--an amount far in excess of that usually found. Because nitrogen is essential plant nutrient, elimination of nitrates from soil or food is not feasible. However, it is recommended that the ingestion of vegetables of known high nitrate content be restricted in infants under three months of age, who are particularly susceptible to nitrite poisoning. (Smith-NWWA)
W73-09249

CORRELATION TO EVALUATE THE EFFECTS OF WASTE WATER PHOSPHORUS ON RECEIVING WATERS,
Wisconsin Univ., Madison. Water Resources Center.
G. P. Fitzgerald, S. L. Faust, and C. R. Nadler.
Water and Sewage Works, Vol 120, No 1, p 48-55, January 1973. 7 tab, 12 ref.

Descriptors: *Bioassay, Growth rates, *Phosphates, *Chemical analysis, Water pollution sources, *Limiting factors, *Cladophora, Lakes, Rivers, On-site tests, Water analysis, Water pollution effects, Wisconsin, Absorption.
Identifiers: *Orthophosphate, Lake Mendota, Lake Monona, Lake Wingra, Lake Wanbesa, Lake Kegonsa, Lake Koshkonong, Badfish Creek, Yahara River, Rock River, Crawfish River, Bark River, Rhizoclonium, Selanastrum capricornutum.

Algal growth tests were conducted with water from several rivers and lakes in Wisconsin to determine the amounts of available phosphorus and the effect and sources of the phosphorus. The methods used were short- and long-term bioassays for measuring available phosphorus, in situ bioassay to determine limiting or surplus phosphorus, and chemical analyses to determine soluble ortho and total phosphorus. Cladophora sp., Rhizoclonium sp., and Selenastrum capricornutum were used in the bioassays. The water system investigated was Lake Mendota, Lake Monona, Lake Wingra, Lake Wanbesa, Lake Kegonsa, Lake Koshkonong and their connecting and feeding rivers. The results of the bioassays and the chemical analyses were compared to ascertain their validity. The results show that soluble ortho PO4-P analyses correlate with bioassays for available phosphorus, and total phosphorus analyses do not correlate. This indicates that either method (bioassay or chemical ortho PO4-P analysis) could be used to measure the phosphorus available for the growth of algae. There was close agreement of results between the two types of bioassay: the one-day sorption-extraction test versus the long-term growth assay, even though the two methods differ greatly. However, since the growth of algae on the phosphorus in water samples is ultimate proof of the availability of phosphorus, the longer growth tests must still be used occasionally to check on the results obtained with the short-term bioassays or chemical analyses of soluble ortho PO4-P. The significance of the tests are discussed with regard to the sources and effects of phosphorus in the lakes and rivers analyzed. (Little-Battelle)
W73-09306

TOXICITY OF COPPER TO THALASSIOSIRA PSEUDONANA IN UNENRICHED INSHORE SEAWATER,
National Marine Water Quality Lab., West Kingston, R.I.
S. J. Erickson.
Journal of Phycology, Vol 8, No 4, p 318-323, December 1972. 6 fig, 3 tab, 16 ref.

Descriptors: *Toxicity, *Copper, *Water pollution effects, *Diatoms, *Bioassay, Heavy metals, Marine algae, Chrysophyta, Sea water, Growth rates, Absorption, Carbon radioisotopes, Water sampling, Water storage, Bacteria, Salinity, Hydrogen ion concentration, Tides.
Identifiers: *Thalassiosira pseudonana, Cyclotella nana, C-14, Population density, Enrichment.

Toxicity of copper to T. pseudonana (formly Cyclotella nana, clone 13-1) was examined in inshore seawater using a 96-hr bioassay method. Raw unenriched seawater was filtered through a 0.22-micron membrane filter and then pasteurized for 30 min at 60 C. Following this treatment, samples contained 0.68-1.14 micrograms Cu/liter. Copper was added as the chloride in 5-microgram increments over the range of 5 to 30 micrograms/liter (about 0.1-0.5 microM). Population densities, mean cell volume, and C-14 bicarbonate uptake were measured. Population growth and C-14 uptake by T. pseudonana displayed inhibition over the entire range of added copper. Growth rate constant (k) to T. pseudonana decreased with increasing copper concentration and during the course of growth of each concentration. Correspondingly, mean cell volumes increased with copper concentration and time. Copper toxicity varied in different water samples. The presence of decomposed natural plankton and detritus decreased toxicity. In the absence of enrichment, bacteria had little effect on copper toxicity. Results were influenced by glassware treatment, collection and storage of seawater, and absence of enrichment. (Holoman-Battelle)
W73-09313

THE RELATIONSHIP OF LIGHT, TEMPERATURE, AND CURRENT TO THE SEASONAL DISTRIBUTION OF BATRACHOSPERMUM (RHODOPHYTA),
Pennsylvania State Univ., University Park. Dept. of Biology.
D. E. Rider, and R. H. Wagner.
Journal of Phycology, Vol 8, No 4, p 323-331, December 1972. 7 fig, 1 tab, 27 ref.

Descriptors: *Limiting factors, Ecological distribution, *Rhodophyta, *Laboratory tests, *On-site investigations, Environmental effects, Light intensity, Water temperature, Aquatic algae, Seasonal, Currents (Water), Separation techniques, Water analysis, Growth rates, Degradation (Decomposition), Carbon dioxide, Solvent extractions, Chlorophyll, Chemical analysis, Hydrogen ion concentration, Iron, Hardness, Sulfates, Spectrophotometry.
Identifiers: *Batrachospermum vagum, *Batrachospermum moniliforme, Chlorophyll a, Mathanol, Organic solvents, Absorbance.

Batrachospermum vagum and B. moniliforme, collected in a dark-water and a clear-water stream,

respectively, were studied in order to elucidate species variation, growth phenomena, and the rate and causes of disintegration. To permit manipulation of environmental factors and simulate the natural habitat of Batrachospermum, a series of chambers was designed and constructed which allowed water in a trough to flow from one compartment to the other at a rate that could be adjusted by changing the slope of the trough. The water used in the sytem, transported from Black Moshannon Spring, was chosen because of its transparency. Carbon dioxide levels were maintained by filling an inverted 2-liter Erlenmeyer flask with pure CO2 once or twice a day and allowing it to diffuse slowly through the water. Chemical characteristics of the water (CO2, pH, iron, hardness, and sulfate) determined, using a Hach kit, after 3 weeks of running the water system with algal samples in it, remained unchanged. Light intensity was varied by raising or lowering lights above the chambers; readings were taken with a YSI-Kettering Model 65 Radiometer and a Weston Model 756 Sunlight Illumination Meter. Samples of B. vagum and B. moniliforme were maintained simultaneously in the trough under constant illumination for periods of 2 or 3 weeks. Chlorophyll was extracted from each sample after complete dehydration. All washes but one were made with methanol and the resulting lump of material was ground with mortar and pestle using MeOH until the wash was colorless and the cell remains were brown. Chlorophyll absorption and the concentration of Chl a were determined using data obtained with the Beckman DB recording spectrophotometer. Observations of the 2 growth sites and the laboratory experiments performed on B. vagum and B. moniliforme indicate that B. moniliforme is better suited to higher intensity illumination than is B. vagum. Without the protection of dark water, the B. moniliforme disintegrated under the high light intensities of summer. In the laboratory, B. moniliforme retained a healthy macroscopic condition over a full range of light-intensity treatments; above 250 ft-c B. vagum was increasingly disintegrated. It was found that within the limitations caused by water depth, current velocity can become limiting to the growth of B. vagum. Although the evidence for environmental factors affecting the growth of B. moniliforme in Smay's Run is less extensive, light intensity and current velocity in this site also appear to interact to control the growth pattern of the algae. (Holoman-Battelle)
W73-09314

GROWTH AND EXCRETION IN PLANKTONIC ALGAE AND BACTERIA,
Scarborough Coll., Toronto (Ontario).
For primary bibliographic entry see Field 05B.
W73-09315

THE EFFECT OF GROWTH ILLUMINATION ON THE PIGMENTATION OF A MARINE DINOFLAGELLATE,
Organization of American States, Washington, D.C.
E. F. Mandelli.
Journal of Phycology, Vol 8, No 4, p 367-369, December 1972. 2 fig, 2 tab, 20 ref.

Descriptors: *Dinoflagellates, *Light intensity, *Plant pigments, *Environmental effects, Pyrrophyta, Marine algae, Protozoa, Solvent extractions, Cultures, Invertebrates, Marine animals, Separation techniques, Phytoplankton.
Identifiers: *Amphidinium klebsii, Chlorophyll a, Chlorophyll c, Carotenoids, Peridinin, Diadinoxanthin, Biosynthesis, Absorption spectra, Infrared spectra, Organic solvents, n-hexane, Ethanol, Carbon disulfide, Acetone, Infrared spectrophotometry, Absorption spectrophotometry, Culture media.

Variations in pigment concentration, especially within the carotenoid pigment system, were investigated in the marine dinoflagellate Amphidinium klebsii in relation to light intensity. Cultures of the dinoflagellate were grown in Guillard's medium 'f' under constant temperature and light intensities of 0.003, 0.032, 0.051, and 0.129 ly/min. Day-night conditions were simulated by alternating 12-hr periods of light and darkness. Cultures were harvested during the light photoperiod at mid-log growth phase; cell densities were determined using a hemacytometer. The pigments were extracted using 90 percent acetone, separated using diethyl ether, hydrated, and spotted on silica gel G. The developing solvent contained petroleum ether, ethyl acetate, and diethylamine (58:30:12v/v). Estimation of pigment concentration and identification of carotenoid pigments by determining absorption spectra in various solvents were carried out using a Beckman spectrophotometer. Amphidinium klebsii cultures grown under different light intensities exhibited similar chlorophyll a content per cell. Among the accessory pigments, chlorophyll c concentration decreased slightly in cells exposed to increasingly light intensities up to 0.129 ly/min. The concentration of the 2 major xanthophylls present in A. Klebsii cells--peridinin and diadinoxanthin--however, varied according to the light background of the cells. Some biochemical pathways in the formation of peridinin in dinoflagellates are discussed. (Holoman-Battelle)
W73-09316

INHIBITION OF PHOTOSYNTHESIS IN ALGAE BY DIMETHYL SULFOXIDE,
York Univ., Toronto (Ontario). Dept. of Biology.
K. H. Cheng, B. Grodzinski, and B. Colman.
Journal of Phycology, Vol 8, No 4, p 399-400, December 1972. 1 fig, 11 ref.

Descriptors: *Photosynthesis, Water pollution effects, *Aquatic algae, *Photosynthetic oxygen, *inhibition, Plant physiology, *Laboratory tests, Bioassay, Chlorophyta, Cyanophyta, Radioactivity techniques, Carbon radioisotopes, Cultures.
Identifiers: Dimethyl sulfoxide, Pollutant effects, Oscillatoria, Anabaena flos-aquae, Anacystis nidulans, Chlorella pyrenoidosa, Organic solvents, C-14.

Bacteria-free cultures of the blue-green algae Oscillatoria sp., Anabaena flos-aquae, and Anacystis nidulans were grown and harvested according to a previously described method, and Chlorella pyrenoidosa was grown on the Watt and Fogg medium (1966) and harvested as were the blue-greens. The rate of photosynthesis was determined at 30 C by measuring O2 evolution with a Gilson differential respirometer fitted with photoflood lamps which gave a light intensity of 10 klux at the flask level, and by measuring the incorporation of C-14 from C-14-bicarbonate under the same conditions. Cells were suspended to 2.7 ml of 0.01 M phosphate buffer, pH 8, containing 35 micromoles NaHCO3 and O2 evolution was measured for 30 min. Dimethyl sulfoxide (DMSO), a polar solvent which increases the permeability of cell membranes, of the appropriate concentration was added and O2 evolution measured for an additional 30 min, at which time 0.1 ml of C-14-sodium bicarbonate (0.6 microCi) was added and O2 evolution measured for an additional 30 min. A sample (100 microliters) of cell suspension was removed and C-14-incorporation determined. DMSO at concentrations above one percent inhibited photosynthetic oxygen evolution and C-14O2 fixation by all 4 species of algae. (Holoman-Battelle)
W73-09318

NITROGEN FIXATION IN CLEAR LAKE, CALIFORNIA. I. SEASONAL VARIATION AND THE ROLE OF HETEROCYSTS,
California Univ., Davis. Div of Environmental Studies.
A. J. Horne, and C. R. Goldman.
Limnology and Oceanography, Vol 17, No 5, p 678-692, September 1972. 4 fig, 5 tab, 43 ref.

Descriptors: *Eutrophication, *Nitrogen fixation, Nitrogen cycle, Energy budget, *Path of pollutants, Nitrates, Ammonia, Phosphates, Phosphorus, Cyanophyta, Aquatic algae, Phytoplankton, Primary productivity, Cycling nutrients, Methodology, Chemical analysis, Nuisance algae, *California, Colorimetry, Spectrophotometry, Radioactivity techniques, Solvent extractions, Water sampling, Denitrification, Nitrogen, Photosynthesis, Chlorophyta, Freshwater.
Identifiers: Acetylene reduction, *Heterocysts, *Seasonal variation, *Clear Lake (Calif), Ethylene, Aphanizomenon flos-aquae, Anabaena circinalis, C-14, Chlorophyll a, Gas liquid chromatography, Multiple regression analysis, Van Dorn bottles, Kjeldahl procedure, Oocystis.

Details are given of more than 2200 acetylene reduction measurements of aquatic N2 fixation for a 7-month period and their relationship to a correspondingly large number of measurements of other relevant physical and chemical variables. Samples were taken at 0.5- or 1.0-m intervals throughout the water column with a Van Dorn bottle. Samples from each depth were pooled to give a representative sample of the whole basin at that depth. Acetylene reduction was measured essentially by the original technique of Stewart et al. (1967). The main modifications were the exclusive use of unconcentrated phytoplankton samples, larger bottles (60 ml here) and in situ incubation (Horne 1969). Gas samples were analyzed for ethylene by GLC. Daily and hourly rates of reduction were calculated; algae, and heterocysts and cells were counted using a microscopic technique. Heterocysts were expressed either as a percentage of the total number of vegetative cells per species or as the total heterocyst numbers in the entire water column. Spectrophotometric determinations of nitrate, ammonia, and chlorophyll a were made; total-P and PO4-P were estimated colorimetrically. Carbon fixation was measured using the C-14 technique, and total-N using a standard micro-Kjeldahl method. The nitrogen budget was calculated from regular measurements of the nitrogen content of the inflowing and outflowing streams and rainfall, including storm periods. The amount of nitrogen deposited in the sediments was found by direct measurement. Denitrification was estimated from changes in lake nitrogen when conditions were suitable for denitrification. The annual contribution of N2 fixation to Clear Lake in 1970 was about 550 tonnes, 500 Mg (megagrams) or 18 kg/ha, 43 percent of the lake's yearly nitrogen inflow. Biological N2 fixation is implicated as the main cause of large algal nuisance blooms on this lake. A sustained spring peak of fixation was associated with a simultaneous bloom of Aphanizomenon flow-aquae in all three basins, an autumn peak with an ephemeral bloom of Anabaena circinalis occurring at a different time in each basin. A stepwise multiple regression analysis showed that fluctuations in N2 fixation were best described by variations in heterocysts, quantities of blue-green algae, PO4-P, NO3-N, and temperature. Annual rates of N2 fixation were correlated with the proportion of heterocysts in Anabaena. Previous nitrogen budgets for Clear Lake have shown a large excess of nitrogen in outflow over inflow, which is accounted for by the levels of N2 fixation measured. (See also W73-09322) (Holoman-Battelle)
W73-09321

NITROGEN FIXATION IN CLEAR LAKE, CALIFORNIA. II. SYNOPTIC STUDIES ON THE AUTUMN ANABAENA BLOOM,
California Univ., Davis. Inst. of Ecology.
A. J. Horne, J. E. Dillard, D. K. Fujita, and C. R. Goldman.
Limnology and Oceanology, Vol 17, No 5, p 693-703, September 1972. 4 fig, 4 tab, 18 ref.

Descriptors: *Nitrogen fixation, *Eutrophication, *Seasonal, Aquatic alage, Cyanophyta, Primary productivity, Nitrogen cycle, Cycling nutrients,

Water pollution effects, Nitrogen, Iron, Phytoplankton, Nitrates, *California, Water sampling, Protozoa, Chrysophyta, Chlorophyta, Photosynthesis, Ammonia, Biomass.
Identifiers: *Anabaena circinalis, *Heterocysts, *Clear Lake (Calif), Chlorophyll a, Ammonium, Dissolved organic nitrogen, Particulate carbon, Van Dorn bottles, Aphanizomenon, Microcistis, Oscillatoria, Melosira, Cryptomonads, Ciliates, Acetylene reduction, Coscinodiscus, Schroederia.

Nitrogen fixation at three stages of an autumal bloom of Anabaena circinalis was measured after almost simultaneous collection at up to 32 stations in Clear Lake and algal heterocysts, phytoplankton cell numbers, NO3-N, NH4-N, dissolved organic-N, PO4-P, Fe, primary production, particulate carbon, and chlorophyll a were also measured. Nitrogen fixation was significantly and positively correlated to Anabaena heterocyst numbers (P greater 0.0001), negatively correlated to NO3-N (P greater 0.01), and positively correlated to dissolved organic-N (P greater 0.01) and PO4-P (P greater 0.05). A negative correlation with NH4 is probable; no significant relationship was found with the other variables measured. An explanation of the apparent restriction of substantial cyanophycean N2 fixation to nonoligotrophic waters is proposed. The results are consistent with the theory that heterocysts are responsible for N2 fixation in situ under oxic conditions. (See also W73-09321) (Holoman-Battelle)
W73-09322

THE UPTAKE OF UREA BY NATURAL POPULATIONS OF MARINE PHYTOPLANKTON,
Scripps Institution of Oceanography, La Jolla, Calif.
J. J. McCarthy.
Limnology and Oceanography, Vol 17, No 5, p 738-748, September 1972. 2 fig, 5 tab, 25 ref.

Descriptors: *Absorption, *Marine algae, *Phytoplankton, *Ureas, Radioactivity techniques, Primary productivity, Nitrates, Carbon, Chemical analysis, Sea water, Secondary productivity, Water sampling, California, Light intensity, Mass spectrometry, Carbon radioisotopes, Nutrients.
Identifiers: *On board analysis, Ammonium, Van Dorn bottles, PVC sampler, Enrichment, Particulate nitrogen, C-14, N-14, N-15, Nitrogen radioisotopes.

Nitrogen-15 isotopes were used to study the uptake of nitrate, ammonium, and urea by natural phytoplankton populations in 36 samples collected at nine stations off the coast of southern California. Samples for measurement of nitrate, ammonium, and urea productivity and for chemical analyses were collected with a 50-liter PVC sampler or an 8-liter Van Dorn bottle from depths corresponding to the 87, 43, 20, 7, 4, and 1 percent surface light intensity as determined by either submarine photometer or a Secchi disk. Subsamples were filtered through 183-micron nylon mesh to remove the larger zooplankton and were then used to fill 4-liter Pyrex bottles covered with neutral density filters calibrated to simulate the light level at the depth from which the samples were collected. Additions of the N-15-labeled compounds were made to different bottles from each sample; the bottles were plugged with silicone rubber stoppers and placed under natural light in Plexiglas incubators on the deck of the research vessel. The bottles were shaken every few hours and after 24 hr the contents were filtered, the particulate samples dessicated under partial vacuum over silica gel, combusted in a Coleman nitrogen analyzer, and the gaseous product swept into a glass vacuum system. A single beam Nier sector-type mass spectrometer was used to determine the N-15: N-14 ratio of each sample. Portions of sea water samples were analyzed for nitrate, ammonium, urea, particulate nitrogen, and carbon productivity. The percentage of the total phytoplankton nitrogen productivity accounted for by urea varied from less than 1 percent to greater than 60 percent and for the entire study averaged 28 percent. The percentage of total available nitrogenous nutrient (ambient nitrate, ammonium, and urea plus the N-15 additions) utilized per day varied among the stations from a minimum of 5 percent at station 4 (12 km off San Diego) to a maximum of 46 percent at station 19 (off White Point). The average C:N uptake ratio was 12.4. (Holoman-Battelle)
W73-09323

COPEPODS OF MARINE AFFINITIES FROM MOUNTAIN LAKES OF WESTERN NORTH AMERICA,
Alaska Univ., College. Inst. of Marine Science.
M. S. Wilson.
Limnology and Oceanography, Vol 17, No 5, p 762-763, September 1972. 11 ref.

Descriptors: *Copepods, *Salt tolerance, *Lakes, Crustaceans, Invertebrates, Aquatic animals, Zooplankton, Deep water, Systematics.
Identifiers: *Euryhaline, Limnocalanus macrurus, Senecella calanoides, Mesochra rapiens, Huntemannia lacustris, Macroinvertebrates, Harpacticoids, Bear Lake, Arthropods, Waterton Lake, Cedar Lake.

Occurrences of Limnocalanus macrurus, Senecella calanoides, a variation of Mesochra rapiens and Huntemannia lacustris, all copepods either euryhaline or related to marine forms, are recorded from lakes in the Cascade and Rocky Mountains, western North America. (Holoman-Battelle)
W73-09325

FRESHWATER HARPACTICOID COPEPODS OF NEW ZEALAND, I. ATTHEYELLA ELAPHOIDELLA (CANTHOCAMPTIDAE),
Auckland Univ. (New Zealand). Dept. of Zoology.
For primary bibliographic entry see Field 05A.
W73-09327

RECOVERY OF SHIGELLA UNDER ACIDIC CONDITIONS,
Food and Drug Administration, Washington, D.C. Div. of Microbiology.
For primary bibliographic entry see Field 05A.
W73-09332

ECOLOGICAL OBSERVATIONS ON HETEROTROPHIC, METHANE OXIDIZING AND SULFATE REDUCING BACTERIA IN A POND,
Hydrobiologisch Institutt, Nieuwersluis (Netherlands).
For primary bibliographic entry see Field 05A.
W73-09337

ON THE CHANGES IN THE STRUCTURE OF TWO ALGAL POPULATIONS: SPECIES DIVERSITY AND STABILITY,
F. Symons.
Hydrobiologia, Vol 40, No 4, p 499-502, December 15, 1972. 4 ref.

Descriptors: *Aquatic algae, *Plant populations, *Stability, Aquatic plants, Diatoms, Chrysophyta, Chlorophyta, Mathematical studies.
Identifiers: *Species diversity, Synedra acus, Synedra affinis, Synedra ulna, Synedra ulna var. oxyrhynchus, Navicula cryptocephala var. veneta, Navicula cuspidata, Navicula gracilis, Amphora ovalis var. pedunculus, Cymbella affinis, Nitzschia acicularis, Nitzschia recta, Nitzschia sigmoidea, Surirella robusta var. splendida, Pediastrum boryanum, Pediastrum duplex var. clathratum, Pediastrum tetras, Scenedesmus abundans var. brevicauda, Scenedesmus dimorphus, Scenedesmus obliquus var. intermedius, Scenedesmus quadricauda var. maximus, Scenedesmus quadricauda var. westii.

Two algal populations sampled in the same pond were compared and two assumptions were made: (1) When comparing two sample places in the same pond, the one taken nearer to the water edge will show a more diversified population structure. (2) The population taken nearer to the water edge having a more diversified population structure will be more self-regulatory than the one taken from the open water. For each of those two assumptions a quantitative measure was proposed. The calculated coefficients did seem to confirm the assumptions. (Holoman-Battelle)
W73-09338

LIMNOLOGICAL INVESTIGATIONS IN THE AREA OF ANVERS ISLAND, ANTARCTICA,
Virginia Polytechnic Inst. Blacksburg. Dept. of Biology.
G. L. Samsel, Jr., and B. C. Parker.
Hydrobiologia, Vol 40, No 4, p 505-511, December 15, 1972. 2 tab, 13 ref.

Descriptors: Limnology, *Aquatic algae, *Primary productivity, Water properties, *Iced lakes, Photosynthesis, Chlorophyll, Phytoplankton, Aquatic plants, Antarctic, Physical properties, Chemical properties, Chlorophyta, Cyanophyta, Chrysophyta, Biomass, Aquatic bacteria, Protozoa, Crustaceans, Lake sediment, Lake morphology, Water analysis, Chlorides, Nitrates, Water temperature, Chlorella, Chlamydomonas, Hydrogen ion concentration, Turbidity, Dissolved oxygen, Alkalinity, Hardness (Water), Nitrites, Phosphates, Silicates, Calcium, Iron, Sulfates, Diatoms, Radioactivity techniques, Carbon radioisotopes, Radiation.
Identifiers: *Antarctica, Bryophytes, Anvers Island, Lichens, Snow algae, Ammonium, Chroococcus, Oscillatoria, Orthophosphates, Aphanocapsa, Merismopedia, Phormidium, Scotiella, Chlorosarcina, Palmellopsis, Dactylococcopsis, Navicula, Ellipsoidion, Trachychloron, Trochisicia, Monostroma, Prasiola, Chrysococcocus, Chrysapsis, Xanthoria spp, Calliergidium austrostramineum, Polytrichum juniperinum, Caloplaca, C-14.

Comparisons were made of primary productivity, physical features, and chemical and biological composition of two small lakes possessing different 'trophic states' during January, 1970 at Anvers Island, Antarctica. Measurements were made of radiation, water temperature, pH, primary productivity via a C-14 technique, extractable chlorophyll, and carbon fixation. Both lakes, less than 500 meters apart, had partial ice cover the entire season and were underlain with a similar siliceous-rich granite. Striking dissolved chemical differences were chloride (7.5 and 35.0), ammonium-N (0.1 and 2.5), and total phosphate-P (0.03 and 1.7 mg/l), respectively, for lake nos. 1 and 2. Extractable total chlorophyll in subsurface water ranged from 15-41 mg/sq m in lake no. 1 and 35-112 mg/cu m in lake no. 2 during the three week study period. Ranges in net photosynthesis were 0.78-3.5 (Lake no. 1) and 9.0-72.0 mgC/sq m/hr (Lake no. 2). Diel ranges for chlorophyll and carbon fixation also fell within these values. It is hypothesized that enrichment of lake no. 2 with phosphate-P and ammonium-N may account for its higher 'trophic state'. (Holoman-Battelle)
W73-09339

ON THE QUANTITATIVE CHARACTERISTICS OF THE PELAGIC ECOSYSTEM OF DALNEE LAKE (KAMCHATKA),
Yu. I. Sorokin, and E. B. Paveljeva.
Hydrobiologia, Vol 40, No 4, p 519-552, December 15, 1972. 22 fig, 5 tab, 26 ref.

Descriptors: *Ecosystems, *Trophic level, *Biomass, *Primary productivity, *Zooplankton, *Phytoplankton, *Metabolism, Food habits, Ecological distribution, Vertical migration, Organic matter, Aquatic bacteria, Aquatic microorganisms, Eutrophication, Dominant organisms,

Stratification, Predation, Aquatic algae, Copepods, Rotifiers, Diatoms, Carbon radioisotopes.
Identifiers: *Pelagic animals, Energy flow, *Lake Dalnee, Stephanodiscus astraea, Vertical distribution, C-14, Biosynthesis, Nauplii, Cyclops scutifer, Flagellates, Ciliates, Tintinnopsis, Strombidium, Asplanchna priodonata, Desmids, Neutrodiaptomus angustilobis, Keretalla, Asterionella, Ankistrodesmus, Staurastrum.

Data are presented on the biomass, production, metabolism, and trophic relations of the components of the ecosystem of Lake Dalnee (Kamchatka). Water samples were taken with a plastic water bottle of the Suslijaev type from depths selected according to the stratification of the water column. Primary productivity of phytoplankton, trophic characteristics of zooplankters, and bacterial production were measured by a C-14 technique. Counts of phytoplankton, colorless flagellates, and zooplankton were made. The carbon content of the predominant diatom, Stephanodiscus astraea, was measured by wet combustion of its suspension obtained in culture. The data on the spectrum of feeding, on rations and on optimal food concentrations were ascertained. All these data, together with the observations in the lake, were used for the construction of a scheme of energy flow. The scheme shows that the ecosystem of the lake receives the third part of its energy from the land as allochtonous organic matter via microbial biosynthesis. The main part of energy accessible to the animals of the second trophic level is used by protozoa, and of a third part by the predatory rotifer Asplanchna. (Holoman-Battelle)
W73-09340

THE LIFE-HISTORY OF SPHACELARIA FURICIGERA KUTZ. (PHAEOPHYCEAE) II. THE INFLUENCE OF DAYLENGTH AND TEMPERATURE ON SEXUAL AND VEGETATIVE REPRODUCTION,
Groningen Rijksuniversiteit, Haren (Netherlands). Afdeling Plantenoecologie.
F. Colijn, and C. van den Hoek.
Nova Hedwigia, Vol 21, Nos. 1-4, p 899-922, 1971. 7 tab, 11 ref.

Descriptors: *Marine algae, *Phaeophyta, *Life history studies, Reproduction, Cultures, Temperature.
Identifiers: *Sphacelaria furcigera, Culture media.

Cultures of gametophytes and sporophytes of Sphacelaria furcigera from Hoek van Holland formed abundant propagules under 12 C long day (equals 16 hours daylight) and 17 C long day conditions. This agrees with field data from temperature regions which indicate multiplication by propagules in the summer half year. No propagules were formed under 17 C short day, 12 C short day, 4 C long day, and 4 C short day conditions. Plurilocular macrogametangia were abundantly formed under 4 C long day and 12 C long day conditions. Under 17 C long day conditions plurilocular macrogametangia were initially formed, but were soon succeeded by propagules. Unilocular sporangia of the diploid generation were formed at 12 C and 4 C. There are some indications that short day conditions might have an an influence on the formation of these structures, but the evidence is inconclusive. In nature (in temperate regions) unilocular zoidangia and plurilocular gametangia are known mainly from the winter half year, but the scarce data do not indicate whether the daylength might also play a role in their induction. (Holoman-Battelle)
W73-09345

MERCURY CONCENTRATION IN RELATION TO SIZE IN SEVERAL SPECIES OF FRESHWATER FISHES FROM MANITOBA AND NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05B.
W73-09346

EFFECTS OF VARIOUS METALS ON SURVIVAL, GROWTH, REPRODUCTION, AND METABOLISM OF DAPHNIA MAGNA,
National Water Quality Lab., Duluth, Minn.
K. E. Biesinger, and G. M. Christensen.
Journal of the Fisheries Research Board of Canada, Vol 29, No 12, p 1691-1700, December 1972. 1 fig, 7 tab, 21 ref.

Descriptors: *Toxicity, *Heavy metals, *Alkali metals, *Alkaline earth metals, *Bioassay, Water pollution effects, Animal physiology, Crustaceans, Zooplankton, Aquatic animals, Proteins, Enzymes, Statistical methods, Laboratory tests, Water analysis, Cations, Growth rates, Reproduction, Metabolism, Sodium, Calcium, Magnesium, Potassium, Strontium, Chromium, Iron, Manganese, Aluminum, Zinc, Gold, Nickel, Lead, Copper, Cobalt, Mercury, Cadmium, Sulfides, Chemical analysis.
Identifiers: *Daphnia magna, Data interpretation, Biochemical tests, Macroinvertebrates, Arsenic, Barium, Tin, Platinum, Glutamic oxalacetic transaminase.

The toxicities of various metals to Daphnia magna was evaluated on the basis of a 48-hr 50 percent lethal concentration (LC50), a 3-week LC50, and a 16 percent decrease in the number of young born (reproductive impairment). The 3-week 16 percent reproductive impairment concentrations (in micrograms per liter) for the metal ions tested were: Na (I), 680,000; Ca (II), 116,000; Mg (II), 82,000; K (I), 53,000; Sr (II), 42,000; Ba (II), 5800; Fe (III), 4380; Mn (II), 4100; As (V), 520; Sn (II), 350; Cr (III), 330; Al (III), 320; Zn (II), 70; Au (III), 60; Ni (II), 30; Pb (II), 30; Cu (II), 22; Pt (IV), 14; Co (II), 10; Hg (II), 3.4; and Cd (II), 0.17. At metal concentrations permitting survival but impairing reproduction, daphnids weighed less than control animals. Amounts of total protein and glutamic oxalacetic transaminase activity varied with the different metals. The negative logarithm of the solubility product constant (pK sub sp) of the metal sulfides, electronegativity, and the logarithm of the equilibrium constant (log K sub eg) of the metal-ATP complex were positively correlated with toxicity to D. magna. Other physicochemical properties were considered, but no additional correlations were found. (Holoman-Battelle)
W73-09347

SALMON-CANNING WASTE WATER AS A MICROBIAL GROWTH MEDIUM,
Fisheries Research Board of Canada, Vancouver (British Columbia). Vancouver Lab.
G. A. Strasdine, and J. M. Melville.
Journal of the Fisheries Research Board of Canada, Vol 29, No 12, p 1769-1771, December 1972. 2 tab, 9 ref.

Descriptors: *Industrial wastes, Fish handling facilities, *Microbial degradation, Waste water (Pollution), *Bacteria, Canneries, Nutrient requirements, Carbohydrates, Biodegradation, Nitrogen.
Identifiers: *Culture media, *Substrate utilization, *Salmon cannery effluents, Fate of pollutants, Nutrient sources, Sorangium, Bacillus, Streptococcus faecalis, Glucose, Trypticase, Bacto-peptone, Polypeptone, Phytone, Acidicase, Beef extract, Pseudomonas putrefaciens, Aerobacter aerogenes, Lactobacillus plantarum.

Salmon-canning waste water was shown to support the growth of six species of bacteria both as a complete growth medium and as a supplementary source of available nitrogen. Salmon-canning effluent (SCE) was collected from the outfall of a local cannery located on the Fraser River, B.C. The crude waste water was filtered through glass wool and 50-ml samples dispensed into 250-ml Erlenmeyer flasks. Six species of bacteria which may be of commercial value were cultured on the SCE-salts media, and on media using the following available nitrogen sources: trypticase, Bacto-peptone, polypeptone, phytone, acidicase, and beef extract. Total carbohydrate, free glucose, reducing sugar, and total nitrogen were determined by previously described methods. All six species of bacteria showed relatively good growth in the SCE-salts media; with the exception of polypeptone and possibly phytone, this was not true for the remaining nitrogen sources. Based on the results obtained, two general approaches may be considered for the microbial utilization of salmon-canning waste water. The first and probably the simplest of these would include those possibilities in which the SCE serves as an inexpensive source of available nitrogen for the microbial degradation and/or utilization of nitrogen-deficient wastes. One such waste is the spent liquor from the sulfite pulping process. The second approach for SCE would include those methods designed for the microbial utilization of the waste per se as a pollution abatement system and for the production of a marketable product. (Holoman-Battelle)
W73-09350

SOME PHYSIOLOGICAL CONSEQUENCES OF HANDLING STRESS IN THE JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) AND STEELHEAD TROUT (SALMO GAIRDNERI),
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
G. Wedemeyer.
Journal of the Fisheries Research Board of Canada, Vol 29, No 12, p 1780-1783, December 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Fish physiology, *Coho salmon, *Rainbow trout, Juvenile fish, Environmental effects, Water balance, Chemical analysis, Bioassay, hardness (Water), Metabolism, Chlorides, Calcium.
Identifiers: Handling stress, *Biochemical tests, *Blood, Oncorhynchus kisutch, Steelhead trout, Salmo gairdneri, Plasma glucose, Cholesterol, Ascorbate.

The stress of handling juvenile coho salmon (Oncorhynchus kisutch) and steelhead trout (Salmo gairdneri) in soft water and in water with added salts was evaluated using blood and tissue chemistry fluctuations as indices of metabolic and endocrine function. Changes in plasma glucose, chloride, calcium, and cholesterol levels indicated that significant osmoregulatory and metabolic dysfunctions can occur and persist for about 24 hr after handling in soft water. Pituitary activation, as judged by lack of interrenal ascorbate depletion, did not occur. Increasing the ambient NaCl and Ca (2 plus) levels to about 100 milliosmols and 75-120 ppm, respectively, partially or completely alleviated the hyperglycemia and hypochloremia indicating that the stress of handling had been reduced. (Holoman-Battelle)
W73-09352

FINE STRUCTURE OF SOME BRACKISH-POND DIATOMS,
Rhode Island Univ., Kingston. Narragansett Marine Lab.
For primary bibliographic entry see Field 05A.
W73-09353

A BAYESIAN APPROACH TO BIOASSAY,
Oregon State Univ., Corvallis.
F. L. Ramsey.
Biometrics, Vol 28, No 3, p 841-858, September 1972. 7 fig, 11 ref.

Descriptors: *Bioassay, *Toxicity, *Statistical methods, *Estimating, Lethal limits, Water pollution effects, Mathematical studies.
Identifiers: *Bayesian method, *Median tolerance limit, *Data interpretation, Potency curves, Experimental design.

A prior distribution for the class of continuous, non-decreasing potency curves is intorduced. The Bayes posterior distribution resulting from an assay experiment with quantal responses is discussed. Several examples are presented where a posterior modal function is used to summarize the posterior distribution. The examples illustrate the value of obtaining smooth estimates of potency and the value of experimental designs using many doses with few observations per dose. The methods suggested may be used to analyze quantal response from experiments with one observation per dose, situations in which the standard probit and logit methods cannot be used. It is even suggested that one observation per dose may be in fact the best design for estimating ED50. (Holoman-Battelle)
W73-09358

SOME DISTRIBUTION-FREE PROPERTIES OF THE ASYMPTOTIC VARIANCE OF THE SPEARMAN ESTIMATOR IN BIOASSAYS,
California Univ., Los Angeles. School of Public Health.
P. C. Chang, and E. A. Johnson.
Biometrics, Vol 28, No 3, p 882-889, September 1972. 3 tab, 11 ref.

Descriptors: *Bioassay, *Lethal limits, Statistical methods, Laboratory tests, Toxicity, Resistance, Mathematical studies.
Identifiers: *Experimental design, *Spearman estimator, *Asymptotic variance, *Precision, *Data interpretation, Quantal assays, Median tolerance limit.

Some distribution-free properties of the asymptotic variance of the Spearman estimator in bioassay have been investigated. The integral of the function, F (1-F) dx was investigated for distribution functions with varying skewness and kurtosis. It was shown that for various shapes of the tolerance distribution, the asymptotic variance of the Spearman estimator can be expressed approximately in terms of either the standard deviation or the distance between the 5th and the 95th percentile of the tolerance distribution. It was observed that K prime sub 60, K prime sub 80, and K sub sigma all depend upon skewness and kurtosis of distribution functions more than does K prime sub 90. K prime sub 90 equals approximately 0.17 for all those distribution functions except for the t distribution with 1 degree of freedom. These distribution-free properties can be used in planning quantal assays of required precision. (Holoman-Battelle)
W73-09359

ESTIMATION OF MICROBIAL VIABILITY,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Applied Mathematics Div.
For primary bibliographic entry see Field 05B.
W73-09360

QUANTAL RESPONSE ANALYSIS FOR A MIXTURE OF POPULATIONS,
Exter Univ. (England).
For primary bibliographic entry see Field 05A.
W73-09363

FIRST FOOD OF LARVAL YELLOW PERCH, WHITE SUCKER, BLUEGILL, EMERALD SHINER, AND RAINBOW SMELT,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 02H.
W73-09372

ACCUMULATION AND PERSISTENCE OF DDT IN A LOTIC ECOSYSTEM,
Maine Univ., Orono. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W73-09415

TRANSITION OF POLLUTION WITH MERCURY OF THE SEA FOOD AND SEDIMENTS IN MINAMATA BAY (IN JAPANESE),
Kumamoto Univ. (Japan). Dept. of Hygiene.
For primary bibliographic entry see Field 05B.
W73-09416

TRITIUM AND ITS EFFECTS IN THE ENVIRONMENT--A SELECTED LITERATURE SURVEY,
Battelle Memorial Inst., Columbus, Ohio.
A. W. Rudolph, T. E. Carroll, and R. S. Davidson.
Available from NTIS, Springfield, Va. 22151, BMI-171-203, Price $6.00 printed copy; $0.95 in microfiche. Battelle Memorial Institute Columbus Laboratories Report BMI-171-203, June 30, 1971. 378 p. USAEC Contract AT (26-1)-171 and W-7405-eng-92.

Descriptors: *Bibliographies, *Abstracts, *Tritium, Path of pollutants, Water pollution sources, Water pollution effects.

This bibliography surveys the literature on tritium and its effects in the environment, with emphasis on man. Abstracts are included to describe the content of the references without relating specific details. All index terms associated with each article are listed in the compilation immediately following the abstract. A subject, author, and report number index are provided. Each entry consists of an alphabetically ordered index term, full title of the reference, and all significant terms by which the article is indexed. (Knapp-USGS)
W73-09433

DISTRIBUTION OF TRACE ELEMENTS IN THE ENVIRONMENT AND THE OCCURRENCE OF HEART DISEASE IN GEORGIA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W73-09469

LEAD IN SOILS AND PLANTS: A LITERATURE REVIEW,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 05B.
W73-09479

EMBROYO-FETOTOXIC EFFECT OF SOME ORGANIC MERCURY COMPOUNDS,
Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
U. Murakami.
Annual Report of the Research Insitute of Environmental Medicine, Nagoya University, Vol 19, p 61-68, 1972. 5 tab, 14 ref.

Descriptors: *Toxicity, *Human diseases, *Animal pathology, *Mercury, Biology, Biochemistry, Pathology, Water pollution effects, Public health, Laboratory tests, Cytological studies, Heavy metals.

Information is updated on cases of Minamata disease given in the 1971 annual report and presents briefly several new experiments using the organic mercury compounds, methylmercuric chloride, methylmercuric sulfide and methylmercuric dicyandiamide. The autopsy findings in human cases and results of animal experiments showed incidence of malocclusion and congenital malformation of the teeth such as irregular size, which when compared with incidence in the general population suggest that alkyl mercuries may show embryotoxicity. Several animal experiments using organic mercury seem to show evidence of embryo-toxicity and teratogenicity. In studies of the effect of organic mercury compounds upon mitotis it was observed that chromosome breakage and c-mitosis occurred, resulting in polyploid and aneuploid cells, which were morphologically manifest as tumors. It can be concluded that there is the possibility that organic mercury compounds might cause not only fetopathy, but also embryopathy and gametopathy. This should be an urgent subject for study. (See also W73-09485) (Jerome-Vanderbilt)
W73-09484

EFFECT OF METHYLMERCURIC CHLORIDE ON EMBRYONIC AND FETAL DEVELOPMENT IN RATS AND MICE,
Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
M. Inouye, K. Hoshino, and U. Murakami.
Annual Report of the Research Institute of Environmental Medicine Nagoya University, Vol 19, p 69-74, 1972. 4 fig, 3 tab, 6 ref.

Descriptors: *Animal pathology, *Mercury, *Environmental effects, Biology, Biochemistry, Pathology, Animal physiology, Laboratory tests, Analytical techniques, Water pollution effects, Mammals, Diseases, Toxicity, Growth rates, *Rodents.
Identifiers: *Methylmercury.

Rats and mice were used in experiments to investigate the effects of methylmercuric chloride upon embryonic and fetal development. A daily dosage of 5 mg/kg/day of methylmercuric chloride was administered to rats on days 0-12, days 7-14, and days 12-20 of pregnancy while a single 30 mg/kg dose was issued to mice on each day from 6* to 13 of pregnancy. Apparent teratogenicity was found in the mouse fetus while there was no apparent teratogenic effect shown in the rat. The effect of methylmercury on brain development in the rat and the mouse was similar. Tissue defects were found in the brain mantle, corpus callosum, fornix, nucleus caudatus-putamen, hypothalamus, pedunculus cerebri, and cerebellar primordium. The ventricles were enlarged and ependymal lining was exfoliated. In mice there were no differences in the brain lesion among the groups treated in different developmental stages. These findings support the opinion that alkylmercury might not influence the immature brain but might cause greater damage when it has developed. (See also W73-09484) (Jerome-Vanderbilt)
W73-09485

EXCRETION RATE OF METHYL MERCURY IN THE SEAL (PUSA HISPIDA),
Helsinki Univ. (Finland). Dept. of Radiochemistry.
M. Tillander, J. K. Miettinen, and I. Koivisto.
Food and Agriculture Organization of the United Nations, Bulletin Number FIR:MP/70/E-67, October 21, 1970. 6 p, 3 fig, 1 tab, 7 ref.

Descriptors: *Aquatic animals, *Mercury, *Distribution patterns, Biology, Biochemistry, Bioassay, Water pollution effects, Food chains, Diseases, Furbearers, Toxins, Analytical techniques, Radiochemical analysis.
Identifiers: *Methylmercury.

The retention and excretion rates of a methylmercury compound in the body of a seal were investigated using 203 Hg-labeled methylmercury and the whole body counting technique. CH3 203 Hg-proteinate containing 6.5 microcuries 203 Hg and 12 micrograms stable Hg was packed into two gelatin capsules which were concealed in herrings and fed to a 9 month old female seal weighing approximately 40 kg. A third capsule was sealed in a glass tube and used as a standard. The seal suffered no ill effects from this treatment. A whole body count was taken on a daily basis and a Baird

Atomics single channel analyzer was used to measure the 203 Hg activity. The 203 Hg initially showed an apparent increase due to redistribution of the methylmercury into fatty tissue near the surface. After 27 days the activity decreased. Retention was estimated to be between 80 and 100%. About 45% of the CH3 203 Hg administered as a single dose of methylmercury was excreted with the very long biological half-time of 500 days, but most was excreted with a half-time of 3 weeks. (Jerome-Vanderbilt)
W73-09486

TOXICITY AND DISTRIBUTION OF MERCURY IN PIGS WITH ACUTE METHYLMERCURIALISM,
Washington State Univ., Pullman. Dept. of Veterinary Pathology.
R. C. Piper, V. L. Miller, and E. O. Dickinson.
American Journal of Veterinary Research, Vol 32, No 2, p 264-273, February 1971. 2 tab, 35 ref.

Descriptors: *Mercury, *Toxicity, *Laboratory animals, Heavy metals, Toxins, Analytical techniques, Distribution patterns, Foods, Animal metabolism, Animal pathology.
Identifiers: *Methylmercury, Organomercurials, *Pigs.

Acute toxicity, clinical course, and concentration and distribution of mercury in tissues were determined in 20 pigs given 1 inoculation (oral route) of methylmercury dicyandiamide (MMD) at dose levels of 2.5 to 160 mg./kg. of body weight. Chemical analyses of tissues for mercury were performed by a modified dithizone procedure. Three of 4 pigs given 20 mg of MMD/kg. and all pigs given larger doses died or were euthanatized in extremis. Signs of methylmercurialism, but not deaths, were observed in 6 of 8 pigs, given 5, 10, or 15 mg. of MMD/kg. Toxicosis was not observed in 2 pigs given 2.5 mg./kg. Mercury was diffusely distributed trough the body; concentrations were greatest in the gastrointestinal tract at postinoculation (PI) hours 12 to 28. At PI days 7 to 35, concentrations of mercury were greatest in the renal cortex and then in the liver. Above-average concentrations were also seen in renal medulla, skeletal muscles, and cerebrum; lesser amounts were in all other tissues examined. A latency period of up to 3 weeks was observed in some pigs between administration of MMD and onset of clinical signs. (Oleszkiewicz-Vanderbilt)
W73-09490

LEAD POISONING: RAPID FORMATION OF INTRANUCLEAR INCLUSIONS,
Rochester Univ. Medical Center, N.Y.
D. D. Choie, and G. W. Richter.
Science, Vol 177, No 4055, p 1194-5, September 29, 1972. 1 fig, 1 tab, 9 ref.

Descriptors: *Lead, *Heavy metals, *Toxicity, *Animal pathology, Pathology, Cytological studies, Laboratory animals, Laboratory tests, Animal metabolism.
Identifiers: *Lead poisoning, Intranuclear inclusions.

A single dose of lead (0.05 milligram per gram of body weight) induced characteristic intranuclear inclusions in the epithelium of proximal tubules in rat kidney within 1 to 6 days. The development of the intranuclear inclusions is thus an acute manifestation of lead poisoning, not a delayed one, as has been thought hitherto. Cytoplasmic structures resembling the intranuclear inclusions and situated in the vicinity of endoplasmic reticulum were regularly found in cells bearing the pathognomonic intranuclear inclusions. The latter and the cytoplasmic structures may be derived from a common precursor, perhaps a soluble protein-lead complex. (Oleszkiewicz-Vanderbilt)
W73-09492

RADIOCHEMICAL STUDIES ON EFFECT OF BATHING: II. EFFECT OF SERIAL BATHING ON DISTRIBUTION OF MERCURY COMPOUNDS IN MICE, (IN JAPANESE),
Kyushu Univ., Beppu (Japan). Inst. of Balneotherapeutical Research I.
H. Kawamura.
J Hyg Chem. Vol 17, No 4, p 287-297. 1971. Illus. English summary.
Identifiers: Alkyl mercury, Distribution, *Japan, *Mercury compounds, Mice, Radiochemical studies, Shellfish, *Toxicosis, Methylmercury.

To elucidate the action mechanism of S sludge bath, which showed a specific effect in accelerating urinary excretion of Hg during spa treatment for alkylmercury toxicosis, methyl methylmercuric sulfide, isolated from a poisonous shellfish caught in Minamata Bay, Japan, was labeled with 203 Hg and the Me-Me203HgS and 203 Hg acetate were administered to mice. The effect of hot spring bath on the biological distribution of these labeled Hg compounds was examined. Both labeled Hg compounds showed a marked accumulation in the kidneys after i.p. administration. Systemic distribution of the sulfide was more gradual and homogeneous than that of the acetate. Disappearance of the acetate and sulfide from the organs after i.p. administration was accelerated by continued bathing in S sludge for 3 wk but this action appeared more slowly in the sulfide. This accelerative effect was not significant when the bathing was in simple spa water. After bathing in water containing 203Hg, the amount of Hg in various organs increased up to the 6th day but the increase became insignificant thereafter. The amount of Hg in the animals given simple spa baths was twice that in the animals given S sludge baths. When the mice given Me-Me203HgS were bathed in S sludge labeled with 197Hg acetate, decrease of 203Hg from the liver was much faster than that from the kidneys and the accumulation of 197Hg was extremely small. Concurrent measurement of 197Hg and 203Hg in the liver and kidneys was performed with a 400-channel pulseheight analyzer. The large amount of Hg excreted into the urine of patients with alkylmercury toxicosis by continued bathing in S sludge is the Hg already accumulated in the body and not due to turnover of Hg in the S sludge.--Copyright 1972, Biological Abstracts, Inc.
W73-09496

METHYLMERCURY IN NORTHERN PIKE (ESOX LUCIUS): DISTRIBUTION, ELIMINATION, AND SOME BIOCHEMICAL CHARACTERISTICS OF CONTAMINATED FISH,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05B.
W73-09498

ULTRASTRUCTURAL EVIDENCE FOR NEPHROPATHY INDUCED BY LONG-TERM EXPOSURE TO SMALL AMOUNTS OF METHYL MERCURY,
Oregon Univ., Portland. Dept. of Pathology.
B. A. Fowler.
Science, Vol 175, No 4023, p 780-781, February 18, 1972. 3 fig, 14 ref.

Descriptors: *Mercury, *Metabolism, *Rodents, *Animal pathology, Biology, Chemistry, Physiology, Structure, Mammals, Laboratory tests, Evaluation, Environmental effects, Pollutants, Disease.
Identifiers: *Methylmercury.

Proteinuria has been observed in persons who are occupationally exposed to organo-mercury compounds. To obtain further information on this phenomenon, the author investigated the effects of long term exposure of low doses of methyl mercuric chloride (CH3 Hg Cl) on rat nephron. Wistar rats were fed a high protein diet, and starting at the age of 28 days mercury at 2 ppm as CH3HgCl was added to the rations of 3 male and 6 female rats while 16 rats were kept as a control group. After 12 weeks the animals were killed and analyzed. All kidneys of female experimental animals exhibited a marked change in the pars recta segment of the proximal tubules. Large numbers of spherical masses were present in the tubule lumens. These masses were characterized ultrastructurally by the presence of a smooth endoplasmic reticulum aggregate. (Jerome-Vanderbilt)
W73-09499

ETHYL MERCURY P-TOLUENE SULFONANILIDE: LETHAL AND REPRODUCTIVE EFFECTS ON PHEASANTS,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
J. W. Spann, R. G. Heath, J. F. Kreitzer, and L. N. Locke.
Science, Vol 175, No 4019, p 328-330, January 1972. 2 tab.

Descriptors: *Mercury, Birds, *Reproduction, *Toxicity, Biology, Chemistry, Food chains, Bird eggs, Chemical analysis, Testing, Pollutants, Environmental effects, *Game birds, *Lethal limit.
Identifiers: Pheasants.

In 1969 levels of mercury above the levels accepted for human consumption were found in several species of game birds. Because controlled studies of the lethal and reproductive effects of mercury compounds on birds are scarce, this study was performed to investigate the effects when a diet containing ethyl mercury p-toluene sulfonanilide was fed to ring-necked pheasants. The toxicant was added to the diets of birds at levels of 10, 30, 90 and 270 ppm and compared with birds fed a control diet. Birds fed 30, 90, 270 ppm all died within periods related to the levels of mercury. No obvious differences were found between the mortality of birds fed 10 ppm mercury and birds in the control group. Egg production and survival of third-week embryos were sharply reduced when breeders were maintained on feed containing 10 parts of the mercury compound per million. (Jerome-Vanderbilt)
W73-09500

EGGSHELL THINNING IN JAPANESE QUAIL FED MERCURIC CHLORIDE,
New York State Agricultural Experiment Station, Geneva. Dept. of Food Science and Technology.
G. S. Stoewsand, J. L. Anderson, W. H. Gutenmann, C. A. Bache, and D. J. Lisk.
Science, Vol 171, No 4001, p 1030-1031, 10 September 1971. 1 fig, 1 tab, 16 ref.

Descriptors: *Mercury, Birds, *Bird eggs, Chemistry, Biology, Food chains, Hatching, *Reproduction, Fertility, Chemical analysis, Testing, Growth rates, Pollutants, Environmental effects.
Identifiers: *Quail (Japanese), *Mercuric chloride.

This study was performed to examine egg production, shell thickness, and reproductive efficiency; to determine if mercury was methylated; and to measure the disposition and excretion of mercury in developing Japanese quail fed low amounts of mercuric chloride. Day-old birds were taken and divided into five duplicate groups and fed feed containing 0, 1, 2, 4, or 8 parts of mercury per million as HgC12. During the 9th and 10th weeks eggs were collected from each group and either incubated or analyzed for mercury. At 10 weeks of age all the birds were killed and tissues were taken for mercury analysis. Although egg production, hatchability and fertility were unaffected, eggshell thickness diminished as the concentration of HgC12 in the diet increased. Total amounts of mercury in the tissues were quite proportional to the dosage and were higher in males than females. Methylation of mercury was not observed. (Jerome - Vanderbilt)
W73-09501

ECOLOGICAL STUDIES IN THE MAMMOTH CAVE SYSTEM OF KENTUCKY: II. THE ECOSYSTEM,
Kentucky Univ., Lexington. Inst. of Speleology.
T. C. Barr, Jr., and R. A. Kuehne.
Ann Speleol. Vol 26, No 1, p 47-96, 1971. Illus.
Identifiers: Amphipods, *Bacterial decomposition, Caves, Ecological studies, Ecosystems, Fish, Isopods, *Kentucky, *Mammoth cave, *Microorganisms, Protozoans.

The 'Shrimp Pools' of the Roaring Passage in Mammoth Cave are an example of a moderately complex aquatic community based on bacterial decomposition of stream detritus; protozoans and other microfauna feed on the bacteria and are in turn eaten by isopods, amphipods, and atyid shrimps; crayfishes and amblyopsid fishes represent the higher trophic levels in this community. A preliminary microbiological study showed that bacteria are much less abundant in the cave than in surface soils and streams; decomposition nevertheless proceeds rather rapidly, at least in moist microenvironments, and the decomposers serve as secondary producers in the ecosystem; a large proportion of the bacteria detected was probably transported into the cave by water; and secondary production in bottom silts of pools and lakes probably reaches a maximum near the close of the dry season, in autumn. The quantitative significance of autotrophic microorganisms in the ecosystem remains unknown.--Copyright 1972, Biological Abstracts, Inc.
W73-09503

SELENIUM AND TELLURIUM IN RATS: EFFECT ON GROWTH, SURVIVAL AND TUMORS,
Dartmouth Coll., Hanover, N.H. Dept. of Physiology.
H. A. Schroeder, and M. Mitchener.
Journal of Nutrition, Vol 101, No 11, p 1531-1540, 1971. 7 tab, 2 fig, 17 ref. HE 05076.

Descriptors: *Metabolism, *Rodents, *Toxicity, Biochemistry, Physiology, Growth rates, Retention, Disease, Laboratory tests, Bioassay, Water pollution effects.
Identifiers: *Selenium, *Tellurium.

To evaluate the innate toxic effects of selenate, selenite and tellurite, 313 rats were given 2 ppm selenium or tellurium as these compounds in drinking water from the time of weaning until natural death, in a controlled environment. There were 105 controls. After 1 year, the doses of selenium were increased to 3 ppm. Selenite was extremely toxic, suppressing growth and causing high early mortality in males but less in females; the experiments were ended at 20 to 23 months. Selenate and tellurite were not toxic in terms of growth, survival and longevity. Selenium accumulated in five organs of control rats, although the diet contained only 0.05 microgram/g wet weight; concentrations were more than doubled in selenium-fed animals, with kidney having the most. Fasting serum glucose levels were higher than controls in older selenium- and tellurium-fed males and in younger tellurium-fed females, without excess glycosuria. Fasting serum cholesterol levels were higher than the controls in selenium- and tellurium-fed rats of both sexes, and aortic lipids were considerably increased. In older animals, selenate was both tumorigenic and carcinogenic, whereas tellurite was not, there being 16.9% malignant tumors in the controls, 41.7% in the selenate and 18.2% in the tellurite groups. (Jerome - Vanderbilt)
W73-09505

DISTRIBUTION AND EXCRETION RATE OF PHENYL- AND METHYLMERCURY NITRATE IN FISH, MUSSELS, MOLLUSCS AND CRAYFISH,
Helsinki Univ. (Finland). Dept. of Radiochemistry.
J. K. Miettinen, M. Tillander, K. Rissanen, V. Miettinen, and Y. Ohmomo.
Proceedings of the 9th Japan Conference on Radioisotopes, Tokyo, p 474-478, May 13-15, 1969, Japan Atomic Industrial Forum, Inc. 4 fig, 4 tab, 6 ref.

Descriptors: *Metabolism, *Mercury, Biochemistry, *Toxicity, Analytical techniques, Testing, Laboratory studies, Radioisotopes, Physiology, Distribtuion, Seawater, Freshwater, Water pollution effects, *Mollusks, *Mussels, *Crayfish.

This study was performed to ascertain whether there was any difference in the toxicity, excretion rate, and distribution pattern of radioactive methylmercury when administered by mouth, either as the ionic form CH3 Hg (+) or bound to protein. Organ activity was determined aftervarious time lapses by whole body counting of the live animals. No significant differences were noted between the fish in brackish water and in fresh water. Ten to fifty percent of the administered activity was excreted within one or two days. The remainder was excreted more slowly with phenylmercury nitrate having a shorter biological half time than methylmercury nitrate. After a span of about three weeks the highest concentrations of mercury were found in the flesh, stomach, liver, ovary and kidneys. Although the experiments are continuing, the results show that there is no essential difference in the toxicity, distribution or excretion rate between the ionic and protein-bound forms of methylmercury. From experiments with molluscs, mussels and crayfish it is evident that when mercury compounds are bound to the muscle protein (mercury compound injected) they have a slower excretion rate than when bound to the digestive organs (administered by mouth). (Jerome - Vanderbilt)
W73-09508

MONITORING ZINC CONCENTRATIONS IN WATER USING THE RESPIRATORY RESPONSE OF BLUEGILLS (LEPOMIS MACROCHIRUS RAFINESQUE),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 05B.
W73-09510

SIGNIFICANCE OF MERCURY IN THE ENVIRONMENT,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 05B.
W73-09511

ECOLOGY OF CORTICOLOUS LICHENS: III. A SIMULATION MODEL OF PRODUCTIVITY AS A FUNCTION OF LIGHT INTENSITY AND WATER AVAILABILITY,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-09512

MICROBIAL UPTAKE OF LEAD,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
T. G. Tornadene, and H. W. Edwards.
Science, Vol 176, No 4041, p 1334-1335, June 23, 1972. 15 ref.

Descriptors: *Lead, *Heavy metals, *Cytological studies, Microbial degradation, Microbiology, Laboratory tests, Bioassay, Bacteria.
Identifiers: Cell count, Lead uptake, *Micrococcus luteus, *Azotobacter sp.

Micrococcus luteus and Azotobacter sp. cells grown in broth in contact with a dialysis membrane containing lead bromide were found to immobilize 4,900 and 3,100 milligrams of lead per gram of whole cells, on a dry weight basis, respectively. Culture turbidity and cell count measurements on these and other cell cultures show that lead bromide, lead iodide, and lead bromochloride in concentrations approaching solubility limits have no detectable effect on overall growth rate and cell viability. Analyses of cellular subfractions reveal that fractions of cell wall plus membrane contain 99.3 and 99.1 percent of the lead found associated with Micrococcus luteus and Azotobacter sp., respectively. The remainder is found associated with the cytoplasmic fractions. (Oleszkiewicz-Vanderbilt)
W73-09514

DETERMINATION OF THE COPPER CONCENTRATIONS TOXIC TO MICROORGANISMS,
Moscow State Univ. (USSR). Dept. of Soil Biology.
For primary bibliographic entry see Field 05A.
W73-09515

HEALTH ASPECTS OF TOXIC MATERIALS IN DRINKING WATER,
Environmental Health Service, Rockville, Md.
J. H. McDermott, P. W. Kabler, and H. W. Wolf.
Am J Public Health. Vol 61, No 11, p 2269-2276. 1971.
Identifiers: *Public health, Potable water, Pollution, *Toxic materials, Water pollution effects.

Toxic materials in drinking water are a major problem of water pollution. The development of this situation and the actions being taken to deal with it are reviewed.--Copyright 1972, Biological Abstracts, Inc.
W73-09524

HEALTH ASPECTS OF WATER QUALITY,
Environmental Protection Service, Ottawa (Ontario).
S. K. Krishnaswami.
Am J Public Health. Vol 61, No 11, p 2259-2268. 1971.
Identifiers: *Epidemiology, *Public health, *Human diseases, Water pollution effects, Potable water, Water quality.

The epidemiologic significance of continual human exposure to low-level concentrations of a plethora of organic chemicals and some inorganics in water is not understood. The nutritional significance of water constituents has received little consideration. The safety to various organic and inorganic chemicals purposefully added to drinking water during treatment and distribution should be evaluated and regulation by laws is recommended. The health aspects of other water uses (public recreation, agriculture and food and soft-drink manufacture) should be studied epidemiologically.--Copyright 1972, Biological Abstracts, Inc.
W73-09526

PHYTOPLANKTON SUCCESSION IN A EUTROPHIC LAKE WITH SPECIAL REFERENCE TO BLUE-GREEN ALGAL BLOOMS,
Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
C. K. Lin.
Hydrobiologia, Vol 39, No 3, p 321-334. 1972. Illus.
Identifiers: Anabaena, Aphanizomenon-flos-aquae, Asterionella-formosa, Canada, Cyclotella-meneghiniana, *Eutrophication, Lakes, Microcystis-aeruginosa, Nutrients, Oxygen, *Phytoplankton, Prairies, Silica, Temperature, Water pollution effects, *Cyanoplyta.

An investigation of phytoplankton in Astotin Lake was made between mid-May of 1966 and Sept. of 1967, with particular attention to the ice-free seasons. Astotin Lake is a typical, small eutrophic, kettle lake with shallow, landlocked, hard water in the Canadian prairies. High concentrations of nutrients supported heavy blooms of blue-green algae throughout the summer. The spring communities were dominated by Asterionella formosa in 1966 and by Cyclotella meneghiniana in 1967. Oxygen depletion under ice cover probably explains the failure of an A. formosa population to appear in 1967. Deficiency of silica and a rise in water temperature apparently caused the decline of the spring pulses of diatoms. Relatively high summer water temperature favored the blue-green algal blooms and resulted in a high concentration of organic matter. The decomposition of dead Anabaena cells played an important part in the development of subsequent waterblooms, i.e., Microcystis aeruginosa and Aphanizomenon flos-aquae. The sequence of waterblooms of those species was closely related to the change in water temperature. A. flos-aquae became incompatible with M. aeruginosa when the temperature fluctuated in a wide range. Most of the non-blue-green algae apparently were inhibited by these cyanophyte blooms. Great species diversity appeared intermittently between blooms and a few species of the Scenedesmaceae and the Oocystaceae were relatively compatible to these blooms.--Copyright, 1972, Biological Abstracts, Inc.
W73-09534

PHYTOPLANKTON, PHOTOSYNTHESIS, AND PHOSPHORUS IN LAKE MINNETONKA, MINNESOTA,
Minnesota Univ., Minneapolis. Limnological Research Center.
R. O. Megard.
Limnol Oceanogr. Vol 17, No 1, p 68-87, 1972. Illus.
Identifiers: Anabaena, Lakes, *Minnesota, *Lakes, Minnetonka, *Phosphorus, *Photosynthesis, *Phytoplankton.

The temporal and spatial variations of chlorophyll concentrations (n) and integral photosynthesis (p) are described for a large, morphometrically complex lake. The daily rate of photosynthesis at the average depth where illumination is optimal (p-max) increases, whereas the depth where illumination begins to be saturating (zi) decreases, as chlorophyll concentrations increases. These opposing effects influence the geometric proportions (expressed by the ratio p:pmax) of photosynthesis depth profiles systematically. The regression of the ratio p:pmax) (±zi) on chlorophyll is fitted to an exponential equation with which zi can be estimated from the chlorophyll concentration. Values of zi so estimated are similar to those expected from the reciprocal relationship between zi and chlorophyll required by Lambert's law. Therefore daily integral photosynthesis at any locality can be calculated from measurements of the chlorophyll concentration and the rate of photosynthesis in a single water sample incubated for a half day at the average depth where illumination is optimal. Chlorophyll concentrations increase as concentrations of total P increase, but generally no relationship exists between P concentrations and maximum specific rates of photosynthesis (Pmax). The linear relationship between P and chlorophyll occurs only when Anabaena, a nitrogen-fixing alga, is an important component of the phytoplankton. The quantity of chlorophyll above the depth zi (± ni) represents ca. 60-80% of the chlorophyll in the photic zone. The value of ni where chlorophyll concentrations are 60 mg/m3 (the maximum concentration at most localities in Lake Minnetonka) is about 100 mg Chl/m2. The usual limit for integral photosynthesis at 20C is therefore 5 g C m-2 day-1.--Copyright 1972, Biological Abstracts, Inc.
W73-09546

MICROBIOLOGICAL STUDIES OF THERMAL HABITATS OF THE CENTRAL VOLCANIC REGION, NORTH ISLAND, NEW ZEALAND,
Wisconsin Univ., Madison. Dept. of Bacteriology.
T. D. Brock.
N Z J Mar Freshwater Res. Vol 5, No 2, p 233-258, 1971. Illus.
Identifiers: *Bacteria, *Algae, Cyanidium-Caldarium, Ephydrella-Thermarum, Islands, Mastigocladus- Laminosus, Microbiological studies, *New Zealand, Phormidium-Sp, Synechococcus-Sp, Thermal water regions, Volcanic ash, Zygogonium-Sp.

Studies on the algae and bacteria of North Island thermal areas recorded temperature, pH and species found in these microbial habitats with special attention to organisms living at the highest temperatures. Thermal features were studied at Rotorua (Whakarewarewa and Ohinemutu), Waiotapu (Tourist Reserve and Lady Knox Geyser), Orakei Korako, Taupo Spa, Waikite Springs, Wairakei thermal valley, Wairakei geothermal field, Tikitere, Ketetahi, Lake Rotokawa (Taupo region), Waimangu, De Brett Thermal Hotel (Taupo). The upper temperature limit for blue-green algae in New Zealand is 60-65 deg C, and the species living at the thermal limit is generally Mastigocladus laminosus, although in some cases Phormidium sp. or Synechococcus sp. was found. The Synechococcus sp. characteristic of high temperatures (73-74 deg C) present in North America was not found in New Zealand. In virtually all boiling pools (99-101 deg C) with pH values in the neutral and alkaline range bacteria were found, but in acidic boiling pools, bacteria were absent. The presence in New Zealand of the eucaryotic algae Cyanidium caldarium and Zygogonium sp. is reported for the first time. Further records for the hot spring brine fly Ephydrella thermarum and other ephydrids are given. The observations are compared with previous data on thermal habitats in Yellowstone Park, in Iceland, and in other parts of the world.--Copyright 1972, Biological Abstracts, Inc.
W73-09554

EVALUATION OF TWO METHOD OF AERATION TO PREVENT WINTERKILL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Forestry and Wildlife Science.
For primary bibliographic entry see Field 05G.
W73-09560

THE EFFECT OF ANNUAL RECHANNELING ON A STREAM FISH POPULATION,
Tennessee Univ., Knoxville. Dept. of Zoology.
D. A. Etnier.
Trans Am Fish Soc. Vol 101, No 2, p 372-375. 1972.
Identifiers: Annual, *Channeling, *Fish population, Streams, *Rechanneling (Annual).

Substrate instability and decreased variability of the physical habitat are believed to be the most significant factors responsible for the changes in the fish fauna in the altered stream.--Copyright 1973, Biological Abstracts, Inc.
W73-09564

THE FEEDING BEHAVIOUR OF SOME COMMON LOTIC INSECT SPECIES IN TWO STREAMS OF DIFFERING DETRITAL CONTENT,
National Inst. for Physical Planning and Construction Research, Dublin (Ireland).
E. Fahy.
J Zool Proc Zool Soc Lond. Vol 167, No 3, p 337-350. 1972. Illus.
Identifiers: Algae, Cannibalism, Detrital, Content (Streams), *Feeding habits (Insects), *Insects, Invertebrates, *Lotic insect species, Plecoptera, Prey, Streams.

The trophic relationships of the benthic invertebrates at 2 places of differing detrital content in an oligotrophic stream system were examined during a 12 mo. period. The sites are described and their detrital contents and other abiotic features compared. The faunal list at each site is fairly similar but certain species are more common at or restricted to one or other site. The reasons for this are briefly discussed. The predators and omnivores are in 2 groups: the first feed only on certain prey and are thus limited by the distribution of their prey. The others consume a wide range of prey and have wider distributions. The predator species are non-selective in their choice of prey which are devoured in an intensity which cannot however be related to their density in the benthos. In poorer trophic conditions predators adapt by consuming a greater quantity of algae and detritus; cannibalism and interpredator-predation occur. The prey species are more intensely consumed under poor trophic conditions. The ecology of 2 species of predatory Plecoptera is examined and the results indicate that competition probably occurs between them.--Copyright 1973, Biological Abstracts, Inc.
W73-09567

FLUOROSIS OF SHEEP CAUSED BY THE HEKLA ERUPTION IN 1970,
Iceland Univ., Reykjavik. Inst. for Experimental Pathology.
G. Georgsson, and G. Petursson.
Fluoride. Vol 5, No 2, p 58-66, 1972. Illus.
Identifiers: Ash, Bones, *Fluorosis, Iceland (Hekla eruption), *Sheep, Teeth, *Volcanic ash, Water.

Samples of ash from the erupted volcano contained up to 2,000 ppm of F. Values decreased to 10% within 2 wk and to 2% within 3 wk. During the first week stagnant surface water contained up to 70 ppm F, running water up to 10 ppm. Grass analyzed under layers of ash 10 mm thick, showed 4,300 ppm F on the second day after eruption, and less than 30 ppm after 35-40 days, partly due to rainfall. Acute fluorosis killed 3% of the sheep and 8-9% of lambs in the affected area during the first few weeks through convulsive seizures, pulmonary edema and kidney and liver changes. No skeletal fluorosis was noted except for slight periosteal thickening in less than 0.25% of 400 animals which were x-rayed. In the bones of lambs, F increased 4 fold the normal amount but in adult sheep only 50%. Dental fluorosis occurred in 25.3% of the third incisors which erupted 4 to 9 mo. later and in 8.6% of the second incisors which erupted 9-13 mo. after the volcanic eruption.--Copyright 1973, Biological Abstracts, Inc.
W73-09574

DIATOMS FOUND IN A BOTTOM SEDIMENT SAMPLE FROM A SMALL DEEP LAKE ON THE NORTHERN SLOPE, ALASKA,
N. Foged.
Nova Hedwigia, Vol 21, Nos 2-4, p 923-1035, 1971. 331 fig, 58 ref.

Descriptors: *Diatoms, *Chrysophyta, *Lake sediments, *Aquatic algae, Alaska, Bottom sediments, Systematics.
Identifiers: Achnanthes species, Amphipleura pellucida, Amphora species, Asterionella formosa, Caloneis species, Campylodiscus echineis, Campylodiscus hibernicus, Ceratoneis arcus, Cocconeis species, Cyclotella species, Cymatopleura species, Cymbella species, Denticula species, Diatoma species, Diploneis species, Epithemia species, Epithemia zebra var. saxonica, Eunotia species, Fragilaria species, Gomphonema species, Gyrosigma species, Hantzschia species, Melosira granulata, Melosira teres, Navicula species, Neidium species, Nitzschia species, Oestrupia zachariasis, Opephora martyi, Pinnularia species, Rhoicosphenia curvata, Rhopalodia gibba, Stauroneis species, Stephanodiscus species, Surirella species, Synedra species, Tabellaria species.

In a sediment sample from 15.5 m depth in an unnamed freshwater lake of 1.25 sq. km on the Northern Slope, Alaska (70 degrees 01 min N. lat., 153 degrees 36 min W. Gr.) about 400 forms of diatoms belonging to 36 genera were identified (19 nov. spec., 5 nov. var., and 6 nov. fo. are described). The flora of diatoms is characterized, in addition to the richness of species, by the considerable number of forms, which previously often were found in interglacial or postglacial deposits in Europe or Asia. Especially remarkable are the finds of a number of species of Surirella which is surprisingly great for arctic regions. The lake must be very old, possibly from the Tertiary, since the area has neither been covered by inland ice since that time nor exposed to transgressions by the sea. (Holoman-Battelle)
W73-09622

BIOLOGICAL ASPECTS OF OIL POLLUTION IN THE MARINE ENVIRONMENT, A REVIEW,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
M. J. A. Butler, and F. Berkes.
M.S.C. Manuscript Report No. 22, December 1972. 122 p, 174 ref.

Descriptors: *Oil spills, *Oil pollution, Organic compounds, Solvents, Marine plants, Marine animals, On-site investigations, *Environmental effects, *Bibliographies, *Reviews, Water pollution effects.
Identifiers: *Literature review, Torrey Canyon, Arrow, *Biological effects.

A synthesis of some of the most significant research done on oil pollution and its biological effects is presented. The report includes fairly extensive sections on petroleum hydrocarbons, solvent-emulsifiers, effects of oil pollution on birds, mammals, fish, sediments, and marine communities and case studies of oil pollution including the 'Torrey Canyon' disaster, the Santa Barbara oil spill and the 'Arrow' accident. The geography of oil pollution is explored in such areas as the Baltic Sea, North Sea and Arctic Ocean. The study also aims to analyze the environmental implications of a series of hypothetical incidents that would be associated with activities involving oil exploration, exploitation, export and import, coastal movement and marine transportation activities and facilities. (Ensign-PAI)
W73-09643

UNSTRUCTURED MARINE FOOD WEBS AND 'POLLUTANT ANALOGUES',
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05B.
W73-09649

ENVIRONMENTAL ASPECTS OF DREDGING IN ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom.
Journal of the Waterways, Harbors and Coastal Engineering Division, Vol 98, No WW4, p 475-487, November 1972. 9 fig, 4 tab, 2 ref.

Descriptors: *Salt marshes, *Estuaries, *Atlantic coastal plain, *Dredging, *Water quality, Water pollution, Environmental effects, Balance of nature, Chemical degradation, Sampling.

Results of the initial phase of a project designed to determine the nature and magnitude of environmental changes resulting from dredging activities in estuarine salt marshes along the southeastern Atlantic coast are reported. The chemical response of salt marsh sediments to the deposition of dredged materials and the water quality response to dredging in the estuarine environment are discussed. Two salt marsh areas were studied before and after dredging activities; sediment core samples were taken. Research findings indicate that the depth of spoil material deposited on a marsh will determine what parts of the spoil bank may ultimately return to production as well as dictating the time necessary for chemical rebalancing so that artificial seeding or sprigging could be successfully carried out to accelerate marsh regeneration. Water quality was tested by collecting water samples hourly during 24-hr periods at several stations surrounding each area before, during, and after dredging. It was found that no significant changes in water quality occurred during or after dredging activities. It was concluded that in order to evaluate water quality changes due to dredging specific information must be obtained about the sediments in the area to be studied. No general criteria can be set up for dredging in marine waters. (Ensign-PAI)
W73-09651

PLUTONIUM AND POLONIUM INSIDE GIANT BROWN ALGAE,
Scripps Institution of Oceanography, La Jolla, Calif.
K. M. Wong, V. F. Hodge, and T. R. Folsom.
Nature, Vol 237, No 5356, p 460-462, June 23, 1972. 2 fig, 3 tab, 15 ref.

Descriptors: *Radioisotopes, *Sea water, Pollutants, *Algae, Absorption, *Trace elements, Water pollution efffects, Laboratory tests, *Phaeophyta.
Identifiers: *Plutonium, *Polonium, Pelagophycus porra, Biological indicators.

The giant brown alga, Pelagophycus porra, was sampled to determine plutonium and polonium levels in sea water. The samples were analysed by alpha spectrometry for 239Pu and 210Po content. Polonium concentrations in the outermost thin layer of the algae were found to be 1,000 times greater than those found in the inner layers; the highest concentration of plutonium was also found in outer layers. These differences in sensitivity within a single species suggest that, when comparing two different environments, identical sample tissue from a certain species should be compared. Sampling thin parts of brown algae, or thin outer layers should provide great sensitivity for detecting early changes in the extremely small traces of plutonium which are expected to accumulate in the oceans due to reactor effluents, nuclear fuel processing and fallout. (Ensign-PAI)
W73-09652

5D. Waste Treatment Processes

THE ROLE OF SEDIMENTATION IN THE PURIFICATION OF RESIDUAL WATER, (NOTE SUR LA ROLE DE LA SEDIMENTATION DANS L'EPURATION DES EAUX RESIDUAIRES),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 05G.
W73-09205

THE NAVY AND THE EFFLUENT SOCIETY,
For primary bibliographic entry see Field 05G.
W73-09223

USE OF WASTES FOR IRRIGATION IN THE DONBAS, (OROSHEVIYE STOCHNYMI VODAMI V DONBASSE),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
S. I. Repetun.
NWWA Translation, Typescript, No 8, p 10, August, 1972. Trans. from (Gidrotekhnika i Melioratsya).

Descriptors: Irrigation, Irrigated land, Irrigation efficiency, *Irrigation practices, Gypsum, Alkalinity, Crops, Crop production, Sewage, *Sewage treatment, *Industrial wastes, Phosphates, Calcium sulfate, Sodium, Domestic wastes.
Identifiers: Soviet Union (Ukraine), *Yield (Crops), Sulfuric acid, Field studies.

The natural purification of waste waters in the fields in combination with artificial and economic purification was found to be the most effective, reliable and economic measure for protection of water resources. Conclusions reached after two years of testing at an experimental station were: (1) Industrial waste water from sulfuric acid and superphosphate production can be used for irrigation provided it is diluted with biologically purified domestic sewage in the ratio of 1:4; (2) The best method of waste water irrigation is to water along the ridges at the rate of 2000-2400 m3/hectare (4 growing season waterings of 500-600 m3/hectare each); (3) Potato yield was increased by 24% and corn yield by 54%. Gypsum, when added to the waste-water (in concentrations below 2.t/hectare) had no effect on yield and prevented absorption of sodium by the soil; and (4) Quality, as well as quantity, of the harvest was improved by irrigation with wastewater. (Campbell-NWWA)
W73-09258

IRRIGATION BY SEWAGE, (OROSHENIYE STOCHNYMI VODAMI),
Y. I. Tikhonov.
NWWA Translation, Typescript, No 9, p 5, September, 1972. Trans. from (Gidrotekhnika i Melioratsya).

Descriptors: Irrigation, *Irrigation practices, Crop production, *Sewage treatment, *Fertilization, Fertilizers, Economics, *Economic impact, Waste water treatment.
Identifiers: *Yield (Crops), Soviet Union, Field studies.

In the area under study, considerable yield increase of field crops was realized by irrigation with the sewage from a local town, supplemented in the summer with water from a nearby river. Harvest of the main crops, i.e., cabbage, carrots, beets, corn, and hay were in some cases more than doubled in irrigated fields over the yield in dryland. Profits were increased to the extent that capital investments in the irrigation system were paid for in less than five years. It was also found that mixing mineral fertilizers with the wastewater used for irrigation made it possible to spread them more evenly than by scattering them from a tractor and increased their fertilization effectiveness in terms of crop yield. Shortcomings in the method include frequent interruptions of the water supply, making it difficult to irrigate the fields on schedule; and much hand labor in irrigation was needed, since no machines were available for irrigation with sewage. (Campbell-NWWA)
W73-09259

USE OF SEWAGE FOR IRRIGATION, (ISPOLZOVAIYE STOCHNYKH VOD DLYA OROSHENIA),
V. E. Fedotov, and F. G. Gorkopenko.
NWWA Translation, Typescript, No 9, p 4, September, 1972. Trans. from (Gidrotekhnika i Melioratsya).

Descriptors: Irrigation, *Irrigation practices, *Crop production, Sewage, *Sewage treatment, Fertilizers, Waste water treatment, Sewage bacteria, Sewage lagoons, Irrigation water, Industrial wastes, *Aerobic treatment.
Identifiers: Soviet Union, Yield (Crops).

The experiences of a collective farm with irrigation by means of sewage from a nearby community are given. The farm is located in a dry area, and production of field crops would be almost impossible without irrigation. Yields of crops irrigated with sewage were found to be higher than the

yields of those irrigated with usual irrigation water (river water). Since the river water required the introduction of mineral fertilizers, the cost of these was also saved with irrigation by sewage. Irrigation of treated waste water (mineral and organics, helminth larvae and pathogenic microflora removed) was found to be better than irrigation with the untreated sewage since the materials in the untreated sewage clogged the soil causing rotting of the crops in the fields. Treatment of sewage was carried out directly at the farm in a series of settling ponds. A recent sharp increase in the percentage of industrial waste waters in the sewage was found to adversely affect crop yield. (Smith-NWWA)
W73-09260

WATER AND WASTEWATER PROBLEMS IN RURAL AMERICA.
Commission on Rural Water, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-09264

WASTE WATER TREATMENT SYSTEMS FOR RURAL COMMUNITIES,
System Sciences, Inc., Bethesda, Md.
S. N. Goldstein, and W. J. Moberg.
Commission on Rural Water, Washington, D.C., 1973. 340 p, 29 fig, 23 tab, 39 ref, 3 append.

Descriptors: *Rural areas, *Waste treatment, Waste water (Pollution), Waste water treatment, *Sewage disposal, *Septic tanks, Biochemical oxygen demand, Microorganisms, Coliforms, Sewage lagoons, Soil disposal fields, Soil filters, Soil microbiology, Disinfection, Irrigation, *Maintenance.
Identifiers: Septage, Package plants, Central systems.

A guide to systems and components available for treating waste waters in rural areas is presented, assisting designers and planners of waste water treatment facilities for rural communities in laying out preliminary system plans, and providing the potential client with sufficient information on available alternatives, to enable him to exercise an informed choice among those presented for his consideration. Basic concepts of domestic sewage and treatment processes appropriate to rural settings are given in Chapter One. In Chapter Two, the role and use of soils in waste water treatment and disposal are described. Traditional systems and design approaches for waste water treatment systems are reviewed in Chapter Three. Chapter Four describes new or unusual methods for waste water collection, conveyance, treatment, and disposal where traditional approaches are not appropriate. The traditionally poor record of maintenance and service of small plants is described in Chapter Five; types of management organization that can provide proper plant maintenance and service are suggested. A basis for anticipating the costs of components and systems for treating waste water in rural communities is provided in Chapter Six. Three Appendices are included, presenting: A-an approach for determining building lot sizes on the basis of soil suitability for waste water disposal; B-the role of the National Sanitation Foundation in Component testing; and C-a representative selection of equipment which can be used in small waste water treatment systems. (Campbell-NWWA)
W73-09266

A TRANSPORT MECHANISM IN HOLLOW NYLON FIBER REVERSE OSMOSIS MEMBRANES FOR THE REMOVAL OF DDT AND ALDRIN FROM WATER,
Tennessee State Univ., Nashville. Dept. of Civil Engineering.
L. A. Abron, and J. O. Osburn.
Water Research, Vol 7, No 3, p 461-477, March 1973. 18 fig, 6 tab, 8 ref.

Descriptors: *DDT, *Aldrin, *Pesticide removal, *Aqueous solutions, *Semipermeable membranes, *Reverse osmosis, Chlorinated hydrocarbon pesticides, Membrane processes, Separation techniques, Water quality control, Infiltration, Solubility, Diffusivity, Adsorption, Pollutant identification, Physical properties, *Waste water treatment.

The DuPont hollow nylon fiber reverse osmosis membranes were investigated for use in the removal of DDT and Aldrin from aqueous solution. Because these membranes were developed for the demineralization of brackish waters the removal characteristics for the pesticides were compared with the removal characteristics for the ions commonly found in brackish and hard waters. These membranes rejected 85-95 percent of the brackish-producing ions. Such inorganic ions with respect to the membrane were classified as membrane-non-interacting solutes. DDT and Aldrin were classified as membrane-interacting solutes, and thus the concept of solute rejection by the membrane was different from that which had been developed for the inorganic ions. (Holoman-Battelle)
W73-09302

DENITRIFICATION. STUDIES WITH LABORATORY-SCALE CONTINUOUS-FLOW UNITS,
National Inst. for Water Research, Pretoria (South Africa).
P. J. Du Toit, and T. R. Davies.
Water Research, Vol 7, No 3, p 489-500, March 1973. 1 fig, 9 tab, 11 ref.

Descriptors: *Denitrification, Methodology, *Sewage, Domestic wastes, Laboratory tests, Nitrates, Nitrites, Suspended solids, Chemical oxygen demand, Ammonia, Nitrogen compounds, Gas chromatography, Alkylbenzene sulfonates, Sampling, Chemical analysis, Hydrogen ion concentration, *Waste water treatment.
Identifiers: *Lactate, *Methanol, Continuous flow system, Substrate utilization, *Denitrifying bacteria, Orthophosphates, Fatty acids, Enzymatic techniques, Culture media, Enrichment culture.

Settled domestic sewage, lactate, and methanol were all investigated as carbon sources for denitrification in different types of denitrifying units. The denitrifying units consisted of a suspended growth (SG) unit and a PC unit. The SG units were operated at a hydraulic residence time of 40 h. The stone PC unit was operated at a hydraulic residence time of 10 h. The coke PC unit was operated at different residence times to determine the minimum time required for efficient denitrification of the nitrified effluent. Samples were withdrawn, at the different sampling ports (PC units) at each stage of the experiment after at least three hydraulic residence times had elapsed. Gas samples were periodically taken for analysis by gas chromatography. The units were operated in a controlled temperature room at 20 C. General chemical analysis (COD, total- and orthophosphate, total- and NH3-nitrogen, volatile fatty acids and ABS determinations) was perfomed by means of a Technicon autoanalyzer. Nitrates and nitrites were analyzed by previously described methods and lactate was determined enzymatically. Settled domestic sewage is unsuitable as a carbon source for inducing denitrification, although efficient COD removals can be obtained in the system. The fact that ammonia nitrogen flows freely through this system results in poor total nitrogen removal values. Lactate is an efficient additive for achieving denitrification. Efficient removal of nitrate by lactate addition can be achieved effectively by a C:N ratio of less than 1-5:1, where N represents -NO3 or NO2 nitrogen. Methanol is also suitable for inducing an acceptable rate of denitrification. The packed column type unit appears to be a very effective system for use as a denitrifying unit, particularly when packed with coke to increase the surface are. A denitrifying unit packed with coke and receiving methanol as hydrogen donor used in series with a bacterial disc unit appears to provide an efficient unit for use in water reclamation schemes. (Holoman-Battelle)
W73-09304

PROCESS AND APPARATUS FOR RECOVERING CLEAN WATER FROM DILUTE SOLUTIONS OF WASTE SOLIDS,
Carver-Greenfield Corp., East Hanover, N.J. (Assignee)
C. Greenfield, R. E. Casparian, and A. J. Bonanno.
U. S. Patent No 3,716,458, 10 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 907, No 2, p 474, February 13, 1973.

Descriptors: *Patents, *Waste water treatment, *Waste dilution, *Solid wastes, *Evaporation, *Condensation, Water pollution control, Water quality control, Pollution abatement, Equipment.

Dilute solutions of waste solids are concentrated by heat evaporation to yield water vapor and concentrated solutions holding waste solids. A tank is adapted to receive a stream of the dilute solution. It has a stirring or mixing device to homogenize the dilute solution. A conduit extends from this tank to the first evaporator and another conduit extends to the first condenser. After the dilute solution is heated and water vapor forms, the water vapor flows into the condenser for condensation and recovery. There is a combustion apparatus which supplies heat to the evaporator or evaporators. The waste solids are mixed with oil and subjected to drying by evaporation. If desired, the waste solids may be separated from the oil which may then be recycled. (Sinha-OEIS)
W73-09385

THERMAL REGENERATION ION EXCHANGE PROCESS WITH TRIALLYLAMINE POLYMERS,
ICA Australia Ltd., Melbourne. (Assigne).
For primary bibliographic entry see Field 03A.
W73-09386

PROCESS FOR REMOVING ORGANIC SUBSTANCES FROM WATER, '10A. RENNER.
Ciba-Geigy, Basel (Switzerland). (Assignee).
For primary bibliographic entry see Field 05G.
W73-09387

PROCESS FOR SUBSTANTIAL REMOVAL OF PHOSPHATES FROM WASTEWATERS,
Michigan Chemical Corp., St. Louis. (Assignee).
P. A. Lincoln, and P. G. Delamater.
U. S. Patent No 3,716,484, 5 p, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 907, No 2, p 480, February 13, 1973.

Descriptors: *Patents, *Waste water treatment, Chemical reactions, *Sewage treatment, *Phosphates, *Nutrient removal, *Pollution abatement, Water pollution control, *Water quality control.
Identifiers: Primary treatment, Chemical treatment.

Tabulated results of two experiments are offered as support for the process advancing the substantial removal of phosphates from waste waters and sewage effluents. Soluble phosphates may be removed in the primary treatment stages by means of chemical precipitation utilizing calcium chloride at a pH of 8 - 9.5, or a combination of calcium chloride and calcium hydroxide. (Sinha-OEIS)
W73-09388

WASTE TREATMENT SYSTEM,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
A. B. Turner.

U. S. Patent No. 3,716,139, 5 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 907, No 2, p 399, February 13, 1973.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Filtration, Chemical reactions, Activated carbon, Pollution abatement, *Electrophoresis, Water pollution control, Water quality control, Chemical oxygen demand, Biochemical oxygen demand.
Identifiers: *Chemical treatment.

A minimum size, maximum effluent quality treatment apparatus is obtained by sizing the surge conditioning tank for minimum volume and the filtration-absorption system for maximum flow. The system has a solids separation device consisting of a conveyor belt composed of tightly coiled springs, the surge conditioning tank, and incinerator, and the filtration absorption system. This filtration system consists of three columns - a filter coagulator, a stripper column and an absorption column. The media in the coagulator is a 20 to 50 mesh aluminum powder. The stripper operation is based on the principle of electrophoretic coalescence. The column is filled with a mixture of aluminum powder and granular carbon which react to form a galvanic cell and attract the ions remaining in solution. The absorption column is filled with activated carbon for the removal of COD and BOD by absorption. (Sinha-OEIS)
W73-09389

PROCESS FOR DETOXICATING WASTE WATERS CHARGED WITH ORGANIC CYANIDE IMPURITIES,
Societe Anonyme pour l'Etude et l'Exploitation des Procedes Georges Claude, Paris (France). (Assignee)
J. P. Zumbrunn.
U. S. Patent No 3,715,309, 4 p, 9 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 177, February 6, 1973.

Descriptors: *Patents, *Chemical wastes, *Industrial wastes, *Waste water treatment, Chemical reactions, Pollution abatement, Toxicity, Water quality control, Water pollution control, Plastics.
Identifiers: *Chemical treatment, Nitriles, Acrylonitrile, *Cyanide, Detoxification, Synthetic fibers, Organic cyanide.

This process consists essentially of causing the hydrolysis reaction of organic nitriles into amide by the action of hydrogen peroxide in an alkali medium. Thirteen examples illustrate variations according to specific requirements. The speed of the reaction depends on the excess of active oxygen, the alkalinity and the temperature. Hydrogen peroxide acts as a catalyst in accelerating the hydrolysis reaction of the amide formed by the first reaction. This is particularly applicable to the treatment of waters charged with acrylonitrile. The process, which has the advantage of saturating the effluents with oxygen, permits the total purification to a residual content lower than 0.5 ppm of any effluent coming from chemical synthesis plants, such as factories engaged in producing plastic materials or synthetic fibers, and containing organic nitriles. (Sinha-OEIS)
W73-09391

APPARATUS AND PROCESS FOR TREATING TOXIC WASTE MATERIALS,
Oxy Metal Finishing Corp., Warren, Mich. (Assignee).
A. N. Sulfaro, and A. H. Stein.
U. S. Patent No 3,715,308, 7 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, vol 907, No 1, p 177, February 6, 1973.

Descriptors: *Patents, Metals, *Industrial wastes, Chromium, Pollution abatement, *Toxins, Toxicity, *Waste water treatment, Water pollution control, Water quality control, Oceans.
Identifiers: *Cyanide, *Metal finishing wastes, Chemical treatment.

The apparatus and process provide a system for continuously treating and destroying toxic hexavalent chromium and cyanide constituents in dilute waste streams. A first stage pH electrode and an oxidation-reduction potential cell are mounted in contact with the solution flowing from the first compartment to the second compartment. The ORP meter operates to control the injection of sulfur dioxide or equivalent reagents, such as sodium metabisulfite for admixture with the solution. The pH electrode controls the addition of a mineral acid such as sulfuric acid. A two step reaction occurs under appropriate pH conditions and the solution containing all of the hexavalent chromium in the form of trivalent chromic sulfate overflows into a rectangular duct of a second tank. In the second tank an alkali hydroxide such as caustic raises the pH to 7 or 8. Trivalent chromic sulfate is converted to chromic hydroxide which can be removed by settling. For the removal of cyanide alkaline chlorination is used at a pH of 10.5 or more. The resultant cyanogenchloride (tear gas) is rapidly converted to sodium cyanate by hydrolysis. Sodium cyanate is further heated by oxidation form nitrogen and carbon dioxide, sodium chloride and water. (Sinha-OEIS)
W73-09392

PROCESS FOR SEPARATING WATER FROM POLLUTANTS IN WATER,
M. W. Mar.
U. S. Patent No 3,715,306, 11 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 177, February 6, 1973.

Descriptors: *Patents, Organic compounds, *Wood preservatives (Pesticides), Creosote, *Pesticides, *Wood wastes, Construction materials, Industrial wastes, *Waste water treatment, *Filtration, Solvents, Pollution abatement.
Identifiers: Aromatic halogen compounds, Aliphatic halogen compounds, Pentachlorophenol, Bunker oil.

This process involves the removal of pollutants such as wood preservatives or insecticides from the effluent of a wood treating facility. Common preservatives are creosote alone, or creosote in conjunction with pentachlorophenol, or a mixture of creosote and bunker oil. In the treatment of wood with preservatives some of the organic compounds in the wood may be dissolved by the preservatives and these may be discharged into the water and act as pollutants. Twenty-five examples are presented to illustrate variations in the removal of these pollutants. The polluted water is treated with a heterocyclic compound containing nitrogen and a solvent selected from the group consisting of an aromatic halogen compound and an aliphatic halogen compound. The treated water is passed through a filter which is so constructed as to allow continuous filtration. (Sinha-OEIS)
W73-09393

METHOD OF CONTROLLING THE TEMPERATURE IN A SEWAGE TREATMENT SYSTEM, AND APPARATUS THEREFOR,
H-P. Hefermehl.
U. S. Patent No 3,715,304, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 176, February 6, 1973.

Descriptors: *Patents, *Flocculation, *Filtration, *Aerobic treatment, Temperature, *Farm wastes, Precipitation (Chemical), *Waste water treatment, Polymers, *Sewage treatment, Pollution abatement, Biological treatment, Polyelectrolytes.
Identifiers: Multivalent metals, Chemical treatment, Polyacrylic acis, Ionogenic polyelectrolytes.

This method and apparatus are used for the biological conversion of animal waste products. After separating a phase containing the large solid particles from the other which comprises liquid and small particles, the liquid phase is treated so as to cause flocculation and precipitation of small or suspended particles. The clear liquid is then treated for aerobic biological purification. Hot vapor obtained downstream from the drying of the large particle phase passes into the liquid pahse where the temperature rises to about 20 deg - 50 degC to increase the rate of aerobic purification. Precipitation of the suspended particles present after preliminary treatment is achieved in a range of pH of 4.5 to 7 in conjunction with suitable flocculants and precipitants. Suitable flocculants are particularly high polymerized compounds such as homopolymerized and/or copolymerized polyacrylic acids as ionogenic polyelectrolytes and non-ionogenic anionic and cationic polymers. Recommended precipitants are salts of multivalent metals. (Sinha-OEIS)
W73-09394

ION EXCHANGE DEMINERALIZING SYSTEM,
CCI Aerospace Corp., Van Nuys, Calif. (Assignee).
For primary bibliographic entry see Field 03A.
W73-09395

HIGH CAPACITY PORTABLE WATER PURIFIER,
For primary bibliographic entry see Field 05F.
W73-09397

FLUID TREATMENT DEVICES,
S. Nicko.
U. S. Patent No 3,715,032, 6 p 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 109, February 6, 1973.

Descriptors: *Patents, *Filters, *Filtration, *Water treatment, Equipment, *Water softening, Water quality control, *Valves, Waste water treatment.

The object is to provide a fluid treatment device with a unit that is removable and disposable. The unit may comprise a filter, strainer, water softener, or the like. It is mounted on a valve body and has inlet and outlet ports to be connected to the fluid supply system. An automatic valve mechanism is provided in the valve body to disconnect the discharge port from the inlet port when the treatment unit is removed from the body. (Sinha-OEIS)
W73-09399

SEWAGE DISPOSAL DEVICE,
W. E. Dorn.
U. S. Patent No 3,714,914, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 77, February 6, 1973.

Descriptors: *Patents, *Sewage treatment, *Filtration, Solids, *Sewage disposal, Incineration, Separation techniques, *Pollution abatement, Water pollution control, Water quality control, *Waste water treatment, Equipment, Waste disposal wells.

An outer concrete shell houses a primary settling chamber, a liquid treating chamber, and an access well. A separation and filtration bucket moves on rails between the primary settling chamber and the equipment holding chamber. A drying and separation plate is located directly below the separation and filtration bucket. There is a cast iron grate at the bottom of the combustion chamber and below the grate is an ash pit. The liquid that has been filtered into the primary settling chamber passes over a baffle wall and into a liquid holding chamber where it undergoes final treatment before being discharged. The solids are incinerated in the combustion chamber. (Sinha-OEIS)
W73-09400

METHOD AND APPARATUS FOR STABILIZING ACCUMULATIONS IN AERATED LAGOONS,
Atara Corp., Montreal (Canada). (assignee)
R. W. Slater.
U. S. Patent No 3,714,036, 3p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 906, No 5, p 1722, January 30, 1973.

Descriptors: *Patents, *Aeration, *Waste water treatment, Temperature, *Aerated lagoons, *Sewage treatment, *Aerobic treatment, Water pollution control, Water quality control, Pollution abatement, Treatment facilities.

Raw sewage is fed successively through two pools in series when the temperature is below 10 degrees C. Both pools are lightly aerated allowing decomposable material to settle in the first pool. When the temperature rises to above about 15 degrees C, the sewage is fed directly into the second pool while this pool is aerated more heavily than previously. After three to six weeks bypassing and aerating the feeding of raw sewage through the two pools in series is resumed. (Sinha-OEIS)
W73-09403

ACTIVATED SEWAGE PLANT,
Dravo Corp., Pittsburgh, Pa. (assignee)
D. F. Heaney.
U. S. Patent No 3,713,543, 5 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 906, No 5, p 1607, January 30, 1973.

Descriptors: *Patents, *Treatment facilities, *Sewage treatment, *Waste water treatment, *Filtration, *Aerobic treatment, Chlorination, Water pollution control, Pollution abatement, Water quality control.

Compact disposal units can be installed in locations or neighborhoods where plants requiring lagoons or usual filters would not be acceptable. This is achieved by the use of an in-depth filter through which the effluent liquid from the settling tank flows to the clearwell in which it is collected and chlorinated. Using two filters, the sewage plant can operate continously, one being used while the other is being backwashed and prepared for reuse. The compact package consists of two concentric tanks, the outer one divided into several compartments. The inner tank serves as a settling zone. The outer comprises in rotation, a contact zone, a stabilization zone, an aerobic digester, the backwash well, and a chlorinating and effluent discharge zone. (Sinha-OEIS)
W73-09405

WATER AERATOR,
For primary bibliographic entry see Field 05G.
W73-09406

APPARATUS FOR TREATING WASTE MATERIALS,
FMC Corp., San Jose, Calif. (assignee)
R. Davidson, and F. F. Sako.
U. S. Patent No 3,713,540, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 906, No 5, p 1606, January 30, 1973.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Filtration, Separation techniques, Equipment, Pollution abatement, *Aeration, Water pollution control, Water quality control, Biochemical oxygen demand.

The apparatus may consist of a tank for the sewage, a perforate drum mounted for partial submergence in the sewage and a continuous screen which is guided through the tank in contact with the drum and acts as a filter. Sewage is introduced into the tank and brought into contact with the drum and the clarified liquid is piped out. An air conduit supplies air for reducing the BOD. Control over the volume of liquid in the tank is coordinated with the flow control device which is associated with the outlet pipe drawing off the clarified effluent. When operating with a relatively high solids concentration in the liquid under aeration, a screen with a nominal hole size of 20 microns will produce a filtrate of 40 ppm to 80 ppm of solids. This system can be used in a tank designed for concentrating solids, in an aeration tank of an aerobic digestion system, or in the aeration tank of an activated sludge system. (Sinha-OEIS)
W73-09407

FILTER CARTRIDGE,
Ecodyne Corp., Chicago, Ill. (Assignee)
A. J. Soriente.
U. S. Patent No 3,715,033, 4 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 109, February 6, 1973.

Descriptors: *Patents, *Liquid wastes, *Waste water treatment, *Filters, Filtration, Pollution abatement, Water pollution control, Water quality control, *Ion exchange, Resins.

This invention provides a precoat filter cartridge comprising a rigid tubular core with holes forming an open area in the range 3-9 percent of the total surface area of the core element. A layer of coarse screen in the size 6-10 mesh is wrapped around it. A layer of fine mesh screen approximately 50 x 250 mesh is wrapped around the coarse screen. By uniformly reducing the percent of open area of the surface of the core element, the resulting increase in pressure drop causes the precoat slurry to flow up towards the top of the filter cartridge thereby resulting in a uniform distribution of the precoat medium. The precoat is a layer of ion exchange resin particles in the size range of 60 to 400 mesh. (Sinha-OEIS)
W73-09408

THE ECONOMICS OF INDUSTRIAL WASTE TREATMENT,
Environmental Control Consultancy Services Ltd., London (England).
D. Anderson.
The Chemical Engineer, No 267, p 422-425, November, 1972. 3 tab, 6 ref.

Descriptors: *Waste disposal, *Effluents, *Industrial wastes, *Waste water treatment, Optimization.
Identifiers: Plant selection and design, Waste parameters, In-plant treatment, Sewer disposal.

Problems of industrial waste management differ from those of sewage treatment because they are more complex and their solution may be more flexibly approached. Milk, yeast and phenolic wastes were used as examples of management problems. It was found that the nature, composition, volume, manner, location and timing of industrial waste production are all controllable by the industry, which can then optimize the problem in terms of production economics. Examples illustrate the options open to industry and the need for carefully evaluating the total problem through a multi-discipline approach. Specifically, two such options were considered: (1) discharge of industrial wastes to sewers, and (2) in-plant treatment. Based on United Kingdom data for 1970 and 1972, typical costs of each option were estimated using standard methods. For sewer disposal, oxygen demand characteristics and volume flow were the typical waste parameters having the greatest influence on disposal costs. Representative problems connected with in-plant treatment were discussed since there are no typical effluents and therefore no typical costs. (Weaver-Wisconsin)
W73-09410

ANIMAL WASTES, THEIR HEALTH HAZARDS AND TREATMENT,
Applied Scientific Research Corp. of Thailand, Bangkok.
S. M. A. Durrani.
Thai J Agric Sci. Vol 4, No 4, p 265-270. 1971.
Identifiers: *Farm wastes, *Waste treatment, Animals, Fungi, Hazards, Public health, Methods, Parasites Salmonella.

Animal wastes are a source of many diseases communicable to man including salmonellosis and other bacterial infections, fungus and parasitic infections. Potentially dangerous chemicals are excreted through animal feces and urine. A treatment process must check water pollution caused by waste disposal and must be economical to install. Anaerobic digestion, anaerobic and aerobic lagoons and incinerators are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-09422

RECYCLABLE COAGULANTS LOOK PROMISING FOR DRINKING WATER TREATMENT,
For primary bibliographic entry see Field 05F.
W73-09478

CHEMICAL TREATMENT OF PLATING WASTE FOR ELIMINATION OF CHROMIUM, NICKEL AND METAL IONS,
Lancy Labs., Hamden, Conn.
J. J. Martin, Jr.
Journal New England Water Pollution Control Association, Vol 6, No 1, p 53-72, June 1972. 8 fig, 4 tab.

Descriptors: *Heavy metals, *Chromium, *Nickel, *Waste water treatment, *Industrial wastes, Metals, Recycling, Economics, Water pollution, Settling, Hydrogen ion concentration, Cehmical precipitation, Neutralization.
Identifiers: *Electroplating industry.

It has been found that chemical rinsing of dragout contaminates and chemical batch treatment of spent processing solutions is a practical treatment solution for electroplating installations. Equipment as well as control of treatment processes is of a type familiar to electroplating and plant maintenance departments and does not require special maintenance skills or procedures. Cyanide is treated with sodium hydroxide and sodium hypochlorite; nickel is precipitated as the hydroxide or carbonate; chromium is reduced by sodium bisulfite and precipitated as chromium hydroxide; copper and zinc solutions are neutralized and hydrazine causes the metallic hydroxide to be precipitated. Treatment costs have not materially affected the competitive position of the company in marketing. Chemical rinsing plus water reuse reduces water requirements by three-quarters or from 90 gpm to 20 gpm. A bleed-off of about one-quarter of the total water keeps the dissolved salts low enough to provide adequate rinsing in selected areas. Chemical rinsing and water treatment of spent solutions provides an effluent that can be safely discharged to the stream. (Oleszkiewicz-Vanderbilt)
W73-09493

POTATO STARCH FACTORY WASTE EFFLUENTS: II. DEVELOPMENT OF A PROCESS FOR RECOVERY OF AMINO ACIDS, PROTEIN AND POTASSIUM,
Agricultural Research Service, Philadelphia, Pa. Eastern Marketing and Nutrition Research Div.
E. G. Heisler, J. Siciliano, and S. Krulick.
J Sci Food Agric. Vol 23, No 6, p 745-762, 1972. Illus.
Identifiers: *Amino-Acids, Effluents, Fertilizers, Oxygen, *Potassium, Potato wastes, Protein, Starch, *Waste water treatment, Industrial wastes.

Problems associated with the secondary waste effluents from potato starch factories and the basic studies leading to a proposed ion-exchange process for the treatment of such wastes to decrease the biochemical oxygen demand (b.o.d.) by removal of protein and amino acids are

discussed. The variables studied and the data needed for design of a process are reported. Five products are obtained: a basic amino-acid mixture containing approximately 30% arginine, 8% lysine, and 6% histidine; and acidic and neutral amino compound mixture containing approximately 30% asparagine; potato protein; a fertilizer product having an n.p.k. (N-P-K ratio) of 12-0-22; and a liquid fertilizer containing 8% ammonium sulfate. By the removal of these constituents the b.o.d. is decreased approximately 60%.--Copyright 1972, Biological Abstracts, Inc.
W73-09507

GEOGRAPHICAL INFLUENCE ON COOLING PONDS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05B.
W73-09525

WASTE DISPOSAL SYSTEMS FOR CLOSED CYCLE WATER REACTORS,
C. T. Chave.
Nucl Technol. Vol 15, No 1, p 36-48. 1972. Illus.
Identifiers: *Connecticut, Adsorption, Boric-acid, Charcoal, Gas, Radioactive, *Reactors (Power plants), Thermal pollution, Tritium, *Waste water treatment, Waste disposal.

Waste disposal systems for closed cycle water reactor power plants in Connecticut, were developed. Waste largely originates from moving water in and out of the reactor due to thermal expansion, for adjustment of boric acid concentration and for control of tritium concentration. Escape of H from the coolant gives rise to gaseous waste. Recycling of boric acid and H reduces the waste discharge, but some water must be discharged to reject tritium. Evaporation provides strong leverage for water purification. Some evaporator vapor should be sent up the stacks for tritium and organic concentration control. Stripping H from the coolant to be processed before boric acid concentration simplifies the gas handling problem, while charcoal adsorption greatly reduces radioactive gas discharge to the atmosphere.--Copyright 1972, Biological Abstracts, Inc.
W73-09529

SHIPBOARD WASTE TREATMENT SYSTEMS.

Shipbuilding and Marine Engineering International, p 605-606, October 1972. 3 fig.

Descriptors: *Waste treatment, *Waste disposal, *Ships, Design, Effluents, Waste water treatment.

A new system, designed by a Danish firm, for treatment of solid and fluid wastes on board ship is described. It is composed of two main sections, a unit for treatment of waste water and an incineration unit for burning oil water, oil sludge and sewage sludge. After treatment the effluent is free from odors and bacteria and can be dumped overboard. The treatment system also removes nutrient salts which might otherwise prove harmful to the natural biological balance in various water bodies. Each component is independent of the other, but the two are compact; the waste water unit requires half the floor space of the more conventional treatment plants. The units are supplied with their own internal piping and electric wiring as well as a control panel with motor starters. (Ensign-PAI)
W73-09654

ANALYSIS OF BIOLOGICALLY ACTIVE SURFACES IN WASTE WATER TREATMENT,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. J. Maier.
Paper presented at 63rd Annual Meeting, The American Institute of Chemical Engineers, November 29 - December 3, 1970. 21 p, 18 ref. EPA Grant 17030 DGQ.

Descriptors: *Biodegradation, *Waste water treatment, *Adsorption, Kinetic, Organic compounds.
Identifiers: Biological kinetics, Biological uptake, Slime layer.

A fixed biologically active slime layer was used to determine the kinetics of removal ofremoval of organic substrates. Uptake by slime surfaces acclimated to single substrates appeared to be mass transfer limited at concentrations below 100 mg/l and reaction limited at higher concentrations. Comparison of the rates of carbon uptake versus glucose uptake shows that glucose is almost consumed. By contrast, only a fraction of the degraded starch is consumed, less than 40%. These observations are consistent with the concept of a surface which has catalytic activity for both hydrolysis and carbon uptake and when the active sites are independent and physically separated.
W73-09688

USE OF FILM-FLOW REACTORS FOR STUDYING MICROBIOLOGICAL KINETICS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. J. Maier.
Applied Microbiology, Vol 16, No 7, p 1095-1097, July 1968. 2 fig. EPA Grant 17030 DGQ.

Descriptors: Biodegradation, *Waste water treatment, Adsorption, Kinetics, Trickling filters.
Identifiers: *Biological kinetics, Biological uptake, *Film flow reactors, Slime layers.

The use of a film-flow reactor for studying the kinetics of substrate removal is described. The reactor provides a means of maintaining a uniform layer of biologically-active slime which is stationary while the feed solution is made to flow over the slime surface in a thin film. The study was designed to evaluate process limitations in the trickling filter process which is designed for the biological removal of waste matter from dilute solutions.
W73-09689

SIMULATION OF THE TRICKLING FILTER PROCESS,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. J. Maier, V. C. Behn, and C. D. Gates.
Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 93, No SA4, p 91-112, August 1967. 7 fig, 10 tab, 32 ref. EPA Grant 17030 DGQ.

Descriptors: *Trickling filters, *Biological treatment, *Waste water treatment, Kinetics.
Identifiers: Biological kinetics, Slime layers.

A simple physical model consisting of a flat surface covered with biologically-active slime is used to simulate trickling filter operations. Process variable studies were conducted using glucose as the sole source of carbon in a mixed salt solution. Liquid feed rate has a marked effect on the rate of glucose use at low liquid rates. The results show that mass transfer in the liquid film limits nutrient removal; the top surface of the slime is the major site of metabolic activity.
W73-09691

REGULATIONS FOR SINGLE RESIDENCE WASTE WATER TREATMENT DEVICES PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.
For primary bibliographic entry see Field 06E.
W73-09695

5E. Ultimate Disposal of Wastes

DREDGE SPOIL DISPOSAL IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Dept. of Oceanography; and Rhode Island Univ., Kingston. Dept. of Zoology.
S. B. Saila, S. D. Pratt, and T. T. Polgar.
Available from NTIS, Springfield, Va. 22151 as COM-72-11537, Price $3.00 printed copy; $0.95 microfiche. Marine Technical Report No 2, 1972. 48 p, 23 fig, 4 tab, 96 ref. Sea Grant URI 98-20-6012.

Descriptors: *Dredging, *Sludge disposal, *Sounds, *Rhode Island, Environmental effects, Sediment transport, Data collections, Bathymetry, Benthic fauna, Channel improvement, Waste disposal, Sediments, Physical properties.
Identifiers: *Rhode Island Sound, Dredging disposal, Sea dumping.

Between December 1967 and September 1970 a total of 8.2 million cubic yards of dredge spoil from the Providence River was deposited on an offshore site in Rhode Island Sound. The spoil was carried to sea in scows of 2,000- and 3,000-cubic yard capacity and discharged within a 1-square mile dumping area approximately 4 miles south of Newport, Rhode Island. The depths were between 96 and 106 feet before dumping began. An investigation carried out between March and September 1970 was designed to update physical observations. Although the emphasis of this study was on aspects of spoil disposal which relate to the management of a specific offshore area, information of general ecological importance was obtained on the composition of the benthic assemblages of Rhode Island Sound and on the colonization of new sea bottom by benthic animals. The disposition of spoil was determined by two bathymetric surveys and two series of sediment samples. Patches of spoil were found as much as a mile outside the dump site toward the northwest and the southwest. Over 30 benthic species were found in the lower Providence River indicating a relatively low level of pollution in that part of the spoil source area. (Woodard-USGS)
W73-09142

OIL POLLUTION OF THE SEA,
For primary bibliographic entry see Field 05B.
W73-09222

SOUND WASTE MANAGEMENT CUTS OFFSHORE COSTS,
Weston (Roy F.), Inc., West Chester, Pa. Marine Waste Management Div.
For primary bibliographic entry see Field 05G.
W73-09224

DEEP WELL INJECTION OF LIQUID WASTS,
Dames and Moore, New York.
For primary bibliographic entry see Field 05G.
W73-09247

DEEP WELL DISPOSAL GAINING FAVOR.
For primary bibliographic entry see Field 05G.
W73-09255

HYDRAULIC FRACTURING AND THE EXTRACTION OF MINERALS THROUGH WELLS,
Wisconsin Univ., Madison. Dept. of Minerals and Metals Engineering.
For primary bibliographic entry see Field 08E.
W73-09288

INITIATION AND EXTENSION OF HYDRAULIC FRACTURES IN ROCKS,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 08E.
W73-09289

REAL STRESSES AROUND BOREHOLES,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 08E.
W73-09290

STATIC FRACTURING OF ROCK AS A USEFUL TOOL IN MINING AND ROCK MECHANICS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 08E.
W73-09291

MICROBIOLOGICAL ASPECTS OF GROUND--WATER RECHARGE--INJECTION OF PURIFIED UNCHLORINATED SEWAGE EFFLUENT AT BAY PARK, LONG ISLAND, NEW YORK,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W73-09292

SEWAGE DISPOSAL DEVICE,
For primary bibliographic entry see Field 05D.
W73-09400

SUBSURFACE WASTEWATER INJECTION, FLORIDA,
Geological Survey, Tallahassee, Fla.
M. I. Kaufman.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 99, No IR1, Paper 9598, p 53-70, March 1973. 10 fig, 4 tab, 20 ref.

Descriptors: *Waste disposal wells, *Florida, *Injection wells, *Underground waste disposal, *Hydrogeology, Path of pollutants, Permeability, Aquifer characteristics, Water quality, Aquifers, Brines, Environmental effects, Transmissivity, Limestones.

Deep-well injection of liquid waste is being evaluated in Florida as a management option to help alleviate environmental deterioration of fresh and estuarine waters and increasing problems of waste disposal. Extensive areas of Florida are underlain by permeable saline-aquifer systems that are separated from overlying freshwater aquifers by low-permeability confining materials consisting of clay, evaporites, or dense carbonate rocks. These deep saline zones are the subject of current research designed to assess the environmental impact of subsurface waste storage. Three active deep-well disposal systems currently exist, and two additional systems are under construction. Industrial and municipal wastes are injected into subsurface environments of different hydrogeologic characteristics at depths ranging from 1,400 ft to 3,000 ft. Transmissivities of the receiving carbonate aquifers range from 6,500 gpd per ft in northwest Florida to more than 17,000,000 gpd per ft for the cavernous Boulder Zone in southern peninsular Florida. (Knapp-USGS)
W73-09456

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALTING PLANTS (PART III - NUMERICAL SIMULATION AND DESIGN CONSIDERATIONS),
Dow Chemical Co., Freeport, Tex.
M. A. Zeitoun, W. F. McIlhenny, R. O. Reid, and T. M. Mitchell.
Available from the National Technical Information Service as PB-215 171, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 804, December 1972. 79 p, 24 fig, 10 tab, 25 ref. 14-01-0001-2169, Amdt. 2.

Descriptors: *Brine disposal, *Model studies, Desalination plants, Effluents, Outlets, Waste disposal.
Identifiers: *Marine ecology, *Effluent dispersion, Diffusers, Model flume, Outfall, Designs.

Although at coastal locations, the saline dense effluent from a desalting plant is potentially harmful to the marine organisms, the environmental effects can be minimized or eliminated if the effluent is properly mixed with and diluted by the receiving water. Conceptual designs of outfall systems were previously developed on the basis of laboratory tests and are presented in OSW R and D Progress Report No. 550. Experimental verification of the conceptual designs by the U.S. Army Corps of Engineers was published as Parts I and II of this report (R and D Nos. 714 and 736). The data obtained in the flume study were used to calibrate several existing models for the jet regime. The model chosen gives a reasonable simulation of the geometry of the jet axis and the dilution at the peak of the jet, but was found to oversimulate the lateral spreading factor. Application of equations to the design of diffusers is presented. Numerical simulation of the dispersion of a dense effluent discharge into a homogeneous stream is included. (OSW)
W73-09628

SHIPBOARD WASTE TREATMENT SYSTEMS.
For primary bibliographic entry see Field 05D.
W73-09654

5F. Water Treatment and Quality Alteration

HIGH CAPACITY PORTABLE WATER PURIFIER,
G. H. Teeple, Jr., and J. W. Welsh.
U. S. Patent No 3,715,035, 2 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 110, February 6, 1973.

Descriptors: *Patents, *Water purification, *Filtration, *Resins, *Activated carbon, Potable water, Sediments, Suspended solids, Bacteria, Metals, Salts, Pollution abatement, Separation techniques, Water treatment.

This portable water purifier comprises a two container filter assembly. The containers are arranged one above the other and are separated by a supporting structure. The upper container includes a flexible bag that is adapted to receive and hold liquid to be purified. The bag extends below the level of the lower container inlet. The bag interior communicates with that inlet so that the liquid in the bag may flow to the inlet in response to the elevation of the bag. The bag may be suspended to extend closely about a substantially rigid duct forming portion of the lower container thus forming a sediment trap. Activated charcoal and deionizing resin may be held within compartments of the duct. A particle entrapping porous filter media may separate the charcoal and resin compartments and may be located at the entrance and exit of the rigid duct whereby additional filtering as well as flow regulation may be achieved. The second flexible bag may be suspended by the apparatus to receive purified water discharged from the duct. (Sinha-OEIS)
W73-09397

FLASH EVAPORATOR,
For primary bibliographic entry see Field 03A.
W73-09404

ANIMAL WASTES, THEIR HEALTH HAZARDS AND TREATMENT,
Applied Scientific Research Corp. of Thailand, Bangkok.
For primary bibliographic entry see Field 05D.
W73-09422

GEOTHERMAL RESOURSE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: DEVELOPMENTAL CONCEPTS.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 03A.
W73-09439

RECYCLABLE COAGULANTS LOOK PROMISING FOR DRINKING WATER TREATMENT,
H. M. Miller.
Environmental Science and Technology, Vol 7, No 4, p 304-305, April 1973. 1 fig.

Descriptors: *Water treatment, *Coagulation, *Flocculation, Chemical engineering, Water quality control, Chemical precipitation, Sludge, Potable water, Separation techniques, Waste water reclamation, Pollutants, Water purification, Testing.

A water treatment process has been developed recently by A. P. Black and Cliff Thompson which uses magnesium carbonate as a coagulant. The fact that it is recyclable makes magnesium salt highly attractive. This process promises better quality water and easier sludge handling but costs more than conventional lime-alum or iron systems. A lime slurry is added to raw water which contains either naturally occurring magnesium bicarbonate or magnesium carbonate which has been added. The addition precipitates magnesium hydroxide and calcium carbonate. The magnesium hydroxide acts in a manner similar to the hydrolysis products of iron or aluminum salts and forms a floc which settles impurities out of the water. Because of the high pH, viruses are destroyed and bacteria are removed. The system is in full scale operation at a plant in Montgomery, Alabama. Suggestions for cost reduction are presented. (Jerome-Vanderbilt)
W73-09478

THE LEACHING OF TOXIC STABILIZERS FROM UNPLASTICIZED PVC WATER PIPE: II. A SURVEY OF LEAD LEVELS IN UPVC DISTRIBUTION SYSTEMS,
For primary bibliographic entry see Field 05A.
W73-09521

HEALTH ASPECTS OF TOXIC MATERIALS IN DRINKING WATER,
Environmental Health Service, Rockville, Md.
For primary bibliographic entry see Field 05C.
W73-09524

HEALTH ASPECTS OF WATER QUALITY,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 05C.
W73-09526

FLUORIDE AVAILABILITY AND THE PREVALENCE OF CARIES-FREE NAVAL RECRUITS: A PRELIMINARY TEN YEAR REPORT,
Naval Dental Research Inst., Great Lakes, Ill.
For primary bibliographic entry see Field 05G.
W73-09527

5G. Water Quality Control

HYPOLIMNION REAERATION OF SMALL RESERVOIRS AND LAKES,
Missouri Univ., Rolla.
J. C. Jennett, C. M. Pai, and R. H. Clark.

Available from the National Technical Information Service as PB-220 247, $3.00 in paper copy, $0.95 in microfiche. Missouri Water Resources Research Center, Completion Report, December 1972. 92 p, 17 fig, 16 tab, 35 ref, 3 append. OWRR A-053-MO (1) 14-31-0001-3525.

Descriptors: *Reaeration, *Lakes, *Hypolimnion, *Destratification, Dissolved oxygen, Stratification, Diffusion, Aeration, Oxygenation, Water pollution treatment, Thermal stratification.

The oxygen transfer rates and the oxygen transfer efficiencies of different types of aerators were studied in lakes, and the number of diffusers required for hypolimnion aeration was determined. The types of aerators included a cylindrical stone diffuser, a spherical stone diffuser, and 2 ceramic diffusers which differed in pore size. The oxygen transfer rates and efficiencies of the ceramic diffusers were greater than those of the stone diffusers. For a given type of diffuser, a higher transfer rate was generated with pure oxygen than with air. Hypolimnion aeration of Bray's Lake, Missouri, was feasible using the diffusers studied. (Knapp-USGS)
W73-09103

A PROPOSAL FOR IMPROVING THE MANAGEMENT OF THE GREAT LAKES OF THE UNITED STATES AND CANADA.
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06E.
W73-09110

MATHEMATICAL MODEL FOR SCREENING STORM WATER CONTROL ALTERNATIVES,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 05B.
W73-09119

THE ROLE OF SEDIMENTATION IN THE PURIFICATION OF RESIDUAL WATER, (NOTE SUR LA ROLE DE LA SEDIMENTATION DANS L'EPURATION DES EAUX RESIDUAIRES),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
J. Aubert, and N. Desirotte.
Revue Internationale d'Oceanographie Medicale, Nice, Vol 27, p 41-70, 1972. 12 fig, 7 tab, 29 ref. Article in French.

Descriptors: Sewage, Waste water disposal, *Water purification, *Sedimentation, Particle size, *Bacteria, *E. coli, Settlement, Adsorption.
Identifiers: *Cagnes-Sur-Mer (Fr.), *France.

A study on the influence of sedimentation on pollutants is presented. Samplings of raw sewage waters from the treatment plant of Cagnes-sur-mer and samplings of waters after decantation were studied in situ. Bacteria tended to settle slower and adsorb better in particles of small dimensions. Experiments carried out in vitro with mixtures of particles with different sizes (0.5 to 20 microns) and a suspension of E. coli allowed evaluation of the evolution of the rate of bacteria as a function of sedimentation duration. Sewage waters and settled sludges after discharge into the sea were then studied and the results point out the sedimentary phenomena. (Ensign-PAI)
W73-09205

T-90, CRITERION OR CHIMAERA,
Aarhus Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 05B.
W73-09207

UTILIZATION OF CARD-FLOATS FOR THE STUDY OF SURFACE DRIFT AND APPLICATION IN THE PREVENTION OF COASTAL POLLUTION (UTILISATION DE CARTES-FLOTTEURS POUR L'ETUDE DES DERIVES DE SURFACE ET APPLICATION A LA PREVISION DES P OLLUTIONS CATIERES),
Service Hydrographique de la Marine, Paris (France).
For primary bibliographic entry see Field 05B.
W73-09210

THE POLLUTION OF THE COASTS AND EFFLUENTS IN THE SEA (LA POLLUTION DES COTES ET LES REJETS EN MER),
J. Garancher.
Houille Blanche, Vol 26, No 8, p 779-783, 1971.

Descriptors: *Coasts, *Sewerage, *Sewage disposal, *Outlets, *Water pollution control, Disposal, Dispersion, Control systems, Regulation, Human population, Community development, Water quality control.

Sewerage control measures in coastal towns are insufficient to prevent sea pollution. Appropriate regulations for better control are considered and it is concluded that control of effluent discharge into the sea alone is not sufficient for good coastal water quality. The theoretical aspects of discharge into the sea and the prediction of effluent distribution after discharge are discussed. Measures recently put into effect are evaluated. Consideration is given to the possibility of varying the method of disposal to accomodate the needs of the different coastal populations. (Ensign-PAI)
W73-09215

A SURFACE-ACTIVE CHEMICAL SYSTEM FOR CONTROLLING AND RECOVERING SPILLED OIL FROM THE OCEAN,
Shell Pipe Line Corp., Houston, Tex.
E. A. Milz, and J. P. Fraser.
Journal of Petroleum Technology, p 255-262, March 1972. 9 fig, 6 tab, 5 ref.

Descriptors: *Oil spills, *Chemical wastes, *Surface tension, Water pollution treatment, Water pollution control.
Identifiers: *Oil recovery, *Containment, *Polyurethane foam.

Results of research conducted to devise a system for oil-slick control and oil spill recovery that is independent of the limitations that weather imposes on mechanical containment and recovery devices are presented. The system devised involves the use of a surface-tension modifier. The introduction of a chemical to the water which has a greater spreading force than that of the oil inhibits the spread of the slick. Weather conditions do not significantly alter the effectiveness of this kind of treatment. For oil recovery, the use of polyurethane foam is suggested. The foam has excellent oil sorption properties and it can be generated at the site of the spill. The foam can then be removed through the use of large mesh fish nets; simple squeezing devices will wring the oil from the foam. Tests conducted on this kind of use of chemicals indicate that their ecological effect is less harmful than the effect of the oils they eliminate. (Ensign-PAI)
W73-09220

THE NAVY AND THE EFFLUENT SOCIETY,
T. R. Colemon, and B. M. Kopec.
Sea Power, p 18-21, September 1972. 4 fig.

Descriptors: *Oceans, Ships, *Waste disposal, *Waste storage, *Waste treatment, *Oil spills, Water pollution treatment, Water pollution control, Costs, Design criteria.
Identifiers: *Pollution control programs, Dumping.

The role of the U.S. Navy in the fight against ocean pollution is depicted. Their anti-pollution program is a two-headed one. One facet involves holding refuse on board while ships are in territorial waters (to be dumped later at sea or disposed of on land); the other approach involves developing methods of waste treatment and disposal aboard ship. Cost and design problems associated with the development of shipboard waste disposal systems are outlined. The problem of accidental oil spills and clean-up projects is also discussed. Results of experiments which the Navy has conducted to test the effectiveness of oil barriers, skimmers, and a new chemical treatment called Sea Beads are reported. (Ensign-PAI)
W73-09223

SOUND WASTE MANAGEMENT CUTS OFFSHORE COSTS,
Weston (Roy F.), Inc., West Chester, Pa. Marine Waste Management Div.
M. W. Hooper.
World Oil, p 41-44, September, 1972. 2 fig, 8 ref.

Descriptors: *Governments, *Regulations, *Legislation, Ships, *Waste disposal, *Oceans, Channels, Oil industry, Water quality standards, Water pollution control.
Identifiers: Offshore operators, Platform regulations.

Various state, federal and foreign regulations regulating the disposal of solid wastes into waterways and oceans are reviewed. Jurisdictional conflicts and differences in standards among the regulatory agencies involved are pointed out. The discrepencies between standards for platform operations and seagoing vessels are discussed. For instance, a crewboat located 20 miles offshore may discharge raw sewage into the Gulf of Mexico; a production platform in the same field must process its sewage. Existing sewage treatment systems for vessels and platforms are described. The report concludes that further research ought to be conducted to determine actual and potential effect of solid and liquid waste discharges on marine environment. (Ensign-PAI)
W73-09224

RESCUE OPERATIONS FOR OILED SEABIRDS,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
R. B. Clark, and J. P. Croxall.
Marine Pollution Bulletin, Vol 3, No 8, p 123-127, August 1972. 1 fig, 2 tab, 9 ref.

Descriptors: Oil wastes, *Oil spills, *Birds, *Cleaning, *Detergents, Water pollution control, Environmental effects, Treatment facilities.
Identifiers: *Sea birds, *Water-repellency.

New methods for rescuing sea birds oiled by accidental tanker spills is described. These cleaning methods protect the water repellency of the birds' feathers. However, in some cases, the methods devised are shown to be either impermanent or prohibitively costly. The best cleaning agents developed are believed to be the simple liquid detergents found in most homes. Used at a concentration of one percent and a temperature from 40 deg to 45 deg the detergents were reliable and efficient at removing contaminating oil, and also easily washed off the birds without leaving behind harmful residues. Birds cleaned with detergent can be released within 2-3 weeks of capture. Restoring sea birds damaged by oil entails some essential facilities of a permanent establishment, so it is suggested that such centers be established in areas where they can serve large sectors of coast. (Ensign-PAI)
W73-09225

SEA FISHERIES COMMITTEES,
Manchester Univ. (England). Faculty of Law.

J. McLoughlin.
Marine Pollution Bulletin, Vol 3, No 8, p 118-122, August 1972.

Descriptors: *Foreign countries, *Regulations, *Water policy, *Water quality control, Coasts, Estuaries, Water pollution control, Legal aspects, History, Jurisdiction.
Identifiers: *Great Britain, *Pollution control authorities.

The role of the Sea Fisheries Committees of England and Wales as pollution control authorities is examined. A brief history of the origin and purposes of these committees is presented. Since they were primarily established to control sea fishing within fishery limits, the Sea Fisheries Committees have only a limited jurisdiction over pollution. However, the critical need for ecological protection of coastal areas has led some of the committees to interpret their bylaws freely and act as regulatory agencies for controlling pollution. The major sources of pollution in Fisheries Areas are direct discharges to the sea by local authorities and/or industry, estuarial discharges, and pollution flowing into the sea from rivers. The need for greater dissemination of information to the public on polluting discharges is stressed. Under existing British law there can be no actions taken against polluters unless they are generally known as public nuisances. (Ensign-PAI)
W73-09226

ECOLOGICAL EFFECTS OF DREDGED BORROW PITS,
Research and Ecology Projects, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 05C.
W73-09227

WHAT HAPPENS WHEN LNG SPILLS,
Phillips Petroleum Co., Bartlesville, Okla. Research Div.
W. W. Crouch, and J. C. Hillyer.
Chemtech, p 210-215, April 1972. 5 fig, 14 ref.

Descriptors: *Natural gas, Chemical properties, Ships, Design standards, *Safety factors, *Burning, Water pollution control.
Identifiers: *Liquified natural gas, *Tankers, *Accidental spills, Containment, Recovery.

Plans for transportaing liquified natural gas (LNG) from producing countries to gas-short nations are in the making. Since the transportation of LNG could lead to accidents and spillage it is important to know how the gas behaves during and after a spill. Modern tankers carrying LNG will be double-hull membrane vessles which can withstand a severe collision without rupturing the inner LNG-containing wall. Furthermore, the ships will employ extensive fire fighting equipment for the engine, pump rooms, upper deck and pipe lines. If LNG should be accidentally spilled on water it will evaporate at a steady rate; with large spills this may take several minutes. The principle hazard in a large LNG spill lies in the formation of a combustible vapor that will envelop the spill, drift downwind, and remain near the surface until it is diluted and warmed. If this vapor should come in contact with an ignition source a fire would occur, propagating backwards through the combustible region. (Ensign-PAI)
W73-09228

CALIFORNIA TIGHTENS CLAMP ON EFFLUENTS,
H. M. Wilson.
Oil and Gas Journal, July 24, 1972, p 22-23. 1 tab.

Descriptors: *California, *Water quality control, *Legislation, *Industrial wastes, Water quality standards, Governments, Costs, *Regulation.
Identifiers: *Compliance time tables.

New water-effluent regulations released by the California State Water Resources Control Board are reviewed. The controls apply mainly to water discharged into the ocean by industries and municipalities. Surveys conducted by the industries affected indicate that none of them can presently meet the required standards in all categories. Compliance time tables will be established by regional boards. Some companies fear that the total cost of meeting the new regulations will force them into dire economic straits. The new limits for chromium discharge, for example, will be particularly difficult for most companies to meet. (Ensign-PAI)
W73-09230

POLLUTION CONTROL ASPECTS OF THE BAY MARCHAND FIRE,
W. L. Berry.
Journal of Petroleum Technology, p 241-249, March 1972. 8 fig, 1 tab, 8 ref.

Descriptors: *Oil spills, *Burning, Oil fields, Water pollution treatment, Beaches, Water pollution control, Pollution abatement, *Louisiana.
Identifiers: *Bay Marchand fire, *Oil recovery, *Skimmers, *Oil scoops.

Various methods used to contain and recover the unburned fraction of oil from the Bay Marchand fire are described. An open-seas recovery fleet employed a skimmer system to recover unburned oil as it was emitted from Platform 'B'. Skimming operations were conducted 24 hrs. a day, sea and weather conditions permitting. Oil Scoop systems employed are discussed in some detail. Measures taken to protect the shoreline and to remove oil from beaches and shallow water are reviewed, along with methods for waterfowl protection. The use of chemical dispersants like Shell Oil's Oil Herder is mentioned. (Ensign-PAI)
W73-09231

SCRAMBLE,
J. R. Burkhardt.
Petroleum Today, No 1, p 20-23, 1972. 3 fig.

Descriptors: *Oil spills, *Massachusetts, Equipment.
Identifiers: *Citizen groups, *Oil clean-up, *Oil recovery, Ocean 80, Boston Harbor, Chelsea Creek.

Efforts by the Coast Guard, oil companies and concerned citizens in the Boston area have helped improve Boston Harbor and surrounding coastal waters. Oil clean-up and recovery operations conducted when the barge Ocean 80 ran aground in Chelsea Creek are described. The Boston cooperative team provides strong evidence that oil spill disasters can be avoided through the use of good equipment, organization, manpower and experience. (Ensign-PAI)
W73-09232

EFFECT OF STEEPNESS OF REGULAR AND IRREGULAR WAVES ON AN OIL CONTAINMENT BOOM,
Shell Oil Co., Houston, Tex.
G. E. Walker, Jr.
Journal of Petroleum Technology, p 1007-1013, August 1972. 11 fig, 7 ref.

Descriptors: *Oil spills, Model studies, *On-site investigations, Equipment, *Waves, *Mathematical models.
Identifiers: *Oil containment booms, Splashover.

The effectiveness of oil containment booms in the presence of waves was evaluated. Commercially available booms were experimentally tested in wave tanks, on site in the Gulf of Mexico, and with scale models. A mathematical modeling of boom response in waves was attempted. The tests conducted with production type and scale model booms proved that splashover boom failure can be predicted, in both regular and irregular wave conditions. Efforts to derive a mathematical model were not wholly successful. A simplified model was developed which describes the general motion of the boom. It cannot be used to predict failure because it does not account for the splash producing interactions between the boom and the wave. (Ensign-PAI)
W73-09234

STELLA GO HOME,
F. Garner.
Ecology Today, p 16-17, May-June 1972. 2 fig.

Descriptors: *Oceans, *Waste disposal, *Chemical wastes, Ships, Water pollution, Water quality standards, Foreign countries, International commissions, Water pollution control.
Identifiers: *Tankers, *Stella Maris, *Ocean dumping.

The complex problems involved in ocean dumping are explored, using the case of the Dutch tanker, Stella Maris as an example. Stella's mission was to dispose of 600 tons of chemical wastes by dumping them into the ocean. Public outcry, including formal protests from various foreign governments, halted the tanker. However, dumping still continues and will for a long time to come. Swedish proposals for international agreements to protect the oceans are outlined. Prompt and strong action against dumping is urged. (Ensign-PAI)
W73-09236

DEEP WELL INJECTION OF LIQUID WASTS,
Dames and Moore, New York.
J. M. Heckard.
Engineering Culletin 35, p 22-27, 1969.

Descriptors: Wells, Waste storage, *Waste disposal wells, Waste treatment, *Radioactive waste disposal, Toxins, Industrial wastes, Geologic investigations, Regional analysis, Legal aspects.
Identifiers: Field tests, *Injection zones, Effluent treatment, Injection pressure.

Deep well injection is actually a system of storage, since the waste materials injected into the subsurface formations remain there indefinitely. To serve as an adequate liquid storage reservoir, an injection stratum must have sufficiently high porosity and permeability. Porous sedimentary rocks such as sandstone, limestone, and dolomite are most likely to have the proper geologic characteristics required for waste injection. Three critical factors given which control the operation of an injection well are: (1) the compatibility of the effluent with the formation and the formation fluids; (2) the injection pressure; and (3) the injection rate. Before starting a deep well disposal project, it is highly recommended that the plan be discussed with the appropriate state regulatory agency - in most cases the Department of Health or the Water Pollution Control Agency - to obtain the necessary approvals. Injection into subsurface formations is hown to offer a possible relatively inexpensive means of disposing of harmful substances. It is recommended that the possibility of using deep well disposal be investigated when an economic method for disposal of highly toxic materials must be found. (Campbell-NWWA)
W73-09247

DEEP WELL DISPOSAL GAINING FAVOR.

Journal Water Pollution Control Federation, Vol 45, No 3, March, 1973, p 404-406.

Descriptors: Wells, Waste disposal, *Waste disposal wells, *Regulation, Legal aspects, *Economics, Economic feasibility, *Oil industry, Brines, Geologic formations, Biochemical oxygen demand.

Identifiers: *Brine disposal, Disposal zones (Geologic).

The increasing installation of underground injection systems for the disposal of industrial wastes has caused professionals to reconsider the full potential of the method. Injection is the most popular method for disposal of oilfield brines, and is reported to be on the increase in the chemical processing, pharmaceutical, refining, and metal processing industries. Limitations of the method include the fact that it can be practiced only in certain geologically favorable areas; that only wastes which do not contain suspended solid materials which could cause clogging of the rock pores are suitable for injection; and that the waste cannot have a high BOD which could stimulate biological growth and cause pore clogging. Legal liabilities and constraints which could be placed on the method include negligence, trespass, strict liability, and nuisance. Advantages of the deep well disposal method over other methods include no evaporation energy or land requirements, fewer restrictions than on other methods (such as ocean disposal), and economic feasibility. (Smith-NWWA)
W73-09255

THE GEOPHYSICAL DIRECTORY, (TWENTY--EIGHTH EDITION 1973).
For primary bibliographic entry see Field 03E.
W73-09256

WATER AND WASTEWATER PROBLEMS IN RURAL AMERICA.
Commission on Rural Water, Washington, D.C.

1973. 97 p, 3 fig, 9 tab, 28 ref.

Descriptors: *Waste water treatment, *Water supply development, Sewage disposal, *Sewage treatment, Septic tanks, *Rural areas, Waste water (Pollution), Social aspects, Economics, Diseases, Municipal water, *Water management (Applied), Treatment facilities.
Identifiers: Funding, Sanitation, *Water facilities, Health factors.

The average American with piped-in water uses fifty to seventy-five gallons of water per day in household pursuits ranging from a simple satisfying of his own thirst to doing the family laundry. As a result, a roughly equal amount of wastewater must be disposed of as sewage through kitchen sinks, bathtubs, flush toilets, and other means. Water and waste water facilities presently in use in the United States are studied, including quantity, quality, and types of facilities. Costs of inadequate facilities -health related, economic, and social costs-are reviewed in detail. Problem areas in the national delivery system with emphasis on inadequacy in rural areas are listed. No attempt is made to discuss all the technical problems and developments that relate to water and waste water systems. In any case, the major weaknesses in the national delivery system for rural areas are not found to be technicql in nature; rather, the major needs - commitment, funding, development-are in the area of political choice. (Smith-NWWA)
W73-09264

RURAL WATER SYSTEMS PLANNING AND ENGINEERING GUIDE,
National Water Well Association, Columbus, Ohio.
For primary bibliographic entry see Field 04B.
W73-09265

WASTE WATER TREATMENT SYSTEMS FOR RURAL COMMUNITIES,
System Sciences, Inc., Bethesda, Md.
For primary bibliographic entry see Field 05D.
W73-09266

LIMITATIONS TO LENGTH OF CONTAINED OIL SLICKS,
Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 05B.
W73-09270

A TRANSPORT MECHANISM IN HOLLOW NYLON FIBER REVERSE OSMOSIS MEMBRANES FOR THE REMOVAL OF DDT AND ALDRIN FROM WATER,
Tennessee State Univ., Nashville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-09302

LIQUID SURFACE SWEEPING APPARATUS,
JBF Scientific Corp., Burlington, Mass. (Assignee).
R. A. Bianchi.
U. S. Patent No 3,716,142, 4 p, 11 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 907, No 2, p 400, February 13, 1973.

Descriptors: *Patents, *Flotsam, *Oil spills, *Oil pollution, Skimming, *Pollution abatement, Water pollution control, Water quality control, Separation techniques, Equipment.

The sweeping apparatus consists of a pair of triangular shaped floats or pontoons secured to the bow of the skimmer. The floats when viewed from above have the shape of a right triangle with the hypotenuse being the sweeping face. Efficient sweeping is achieved because the curved underbody of the pontoons causes water flowing under them to be substantially free of turbulence. Since the floats are buoyant, they will follow wave action, lifting with the waves and thus will contain the material floating on the wave surface. The two arms of the float are located with their planar surfaces opposing each other and converging in the direction of water flow. (Sinha-OEIS)
W73-09384

PROCESS FOR REMOVING ORGANIC SUBSTANCES FROM WATER, '10A. RENNER.
Ciba-Geigy, Basel (Switzerland). (Assignee).

U. S. Patent No 3,716,483, 3 p, 4 ref; Official Gazette of the United States Patent Office, vol 907, No 2, p 480, February 13, 1973.

Descriptors: *Patents, *Industrial wastes, Chemical wastes, *Organic compounds, Waste water treatment, Paints, *Oil wastes, Oily water, Dyes, Resins, *Polymers, *Pollution abatement, Water quality control, Water pollution control, Oil spills, Oil pollution.
Identifiers: Melamine-formaldehyde, Urea-formaldehyde.

Contaminated water is brought into contact with a highly disperse, solid, water-insoluble organic polymer of average molecular weight greater than 1000 and a specific surface area greater than 5 m2/g and the polymer charged with the impurity is separated from the water. The polymer can be brought into contact with the contaminated water by stirring or vibration. The polymer is referred to as an absorbent and may be an insoluble melamine-formaldehyde resin or a urea-formaldehyde resin. Five examples are given. The polymer, absorbent may be used for removing dissolved, emulsified or suspended organic substances such as fat, oil, or dyestuff. To remove oil film from a water surface, the polymer may be sprinkled or sprayed as uniformly as possible onto the liquid surface. (Sinha-OEIS)
W73-09387

DEVICE FOR REMOVING OIL SLICKS,
A. Ivanoff.
U. S. Patent No 3,715,034, 6 p, 23 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 110, February 6, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Skimming, *Pollution abatement, Water pollution control, Water quality control, Separation techniques.
Identifiers: *Water craft, Skimmers.

A flat bottomed water craft is constructed to have a broad squared-off bow section that slants sternward from the deck toward the water line. Below the water line in or near the bow section, it has a transverse elongate opening for the ingress of the oil flowing as a continuous layer above the water. The craft has openings preferably near the stern for discharging water which may have entered with the scooped-up oil. Conduits may be used to transfer the collected oil to a mother ship. (Sinha-OEIS)
W73-09398

WATER AERATOR,
E. P. Aghnides.
U. S. Patent No 3,712,548, 5 p, 14 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 906, No 4, p 1333, January 23, 1973.

Descriptors: *Patents, *Aeration, Equipment, *Waste water treatment, *Aerobic treatment, *Sewage treatment, *Pollution abatement, Water pollution control, Water quality control.
Identifiers: *Aerators.

This aerator has a relatively thin diaphragm with square cross-section holes. There is a bridge arrangement over the holes on the upstream side to form either one or two water entrances to each hole. Where there are two entrances they may be of different size to permit the issuing turbulent jet of water to diverge or converge. The casing has an annular enlargement at the downstream end. (Sinha-OEIS)
W73-09406

POLLUTION CONTROL--USES OF CORRECTIVE TAXES RECONSIDERED,
Arizona Univ., Tucson. Dept. of Economics.
J. T. Wenders.
Natural Resources Journal, Vol 12, No 1, p 76-82, January, 1972.

Descriptors: *Water pollution control, *Taxes, *Pollution taxes (Charges), Pollution abatement, Economic efficiency.
Identifiers: *Corrective tax, Equiproportionate abatement rule.

Professor Colin Wright (Natural Resources Journal, 1969) argued that in certain situations the equiproportionate abatement rule is superior to a single corrective tax as a pollution control device. The present author claims that Wright's analysis is incorrect and that the optimal level of pollution can be achieved by a single, constant per unit tax on pollutants emitted. Such a tax insures pollution abatement according to the marginal rule for efficiency, which requires that marginal cost of abatement be the same for each polluter at each successive level of total abatement. Furthermore, a corrective tax would always be superior to the equiproportionate abatement rule, which was found to be more expensive for the same amount of abatement. Administrative costs in the two cases differed insignificantly and thus were irrelevant to the selection of a pollution control device. Two arguments for corrective taxes were presented: (a) they provide an efficient source of revenue for the pollution control board, allowing pollution control programs a chance for quick implementation; and (b) the expected rate of improvement in pollution abatement technology is higher where they are used because the innovating firm experiences a reduction in both tax liability and direct cost of abatement. (Weaver-Wisconsin)

W73-09411

FLUORIDE AVAILABILITY AND THE PREVALENCE OF CARIES-FREE NAVAL RECRUITS: A PRELIMINARY TEN YEAR REPORT,
Naval Dental Research Inst., Great Lakes, Ill.
H. J. Keene, G. H. Rovelstad, S. Hoffman, and W. R. Shiller.
Arch Oral Biol. Vol 16, No 3, p 343-346. 1971.
Identifiers: Epidemiology, *Fluoridation, Fluorides, *Dental health, *Caries, Public health, Potable water.

Epidemiologic and geographic data on caries-free recruits at Great Lakes, Illinois, were collected from 1960-1969. The prevalence of caries-free recruits, as related to the availability of naturally occurring fluoride in public water supplies, is evaluated by correlation analysis. A caries-free recruit was one without clinical or radiographic evidence of dental caries upon entrance into the Navy. A home-state determination was made, based on residence during the major years of tooth development (from birth to 12 yr). The number of caries-free men/1000 recruits was calculated, based on the geographic distribution of a 10% sample of 50,000 men.--Copyright 1972, Biological Abstracts, Inc.
W73-09527

BIODEGRADATION OF ANIMAL WASTE BY LUMBRICUS TERRESTRIS,
Georgia Univ., Athens. Dept. of Dairy Science.
O. T. Fosgate, and M. R. Barr.
J Dairy Sci. Vol 55, No 6, p 870-872. 1972.
Identifiers: *Animal wastes, *Degradation (Biological), Fecal matter, Lumbricus-terrestris, Meal, Soils, Waste recycling, *Earthworms.

The possibility of recycling animal waste through the common earthworm, L. terrestris was studied. Earthworms were raised in beds and fed only raw feces and water with lime added as a buffer. The conversion of kilograms of fecal dry matter to kilograms of live earthworms was 2:1. The excretion (castings) of the earthworm was a loose, friable humus type of soil containing 3.0% N. Earthworm meal dry matter analyzed 58% protein and 2.8% fat and proved to be very palatable when fed to domestic cats. Worm dirt was equal to greenhouse potting soil for the production of flowering plants. An added advantage is that the worm dirt weighs only about 50% as much as normal potting soil.--Copyright 1972, Biological Abstracts, Inc.
W73-09528

GEOLOGY AND LAND RECLAMATION,
Kent State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 04A.
W73-09533

STUDIES ON PRODUCTION AND FOOD CONSUMPTION BY THE LARVAL SIMULIIDAE (DIPTERA) OF A CHALK STREAM,
Freshwater Biological Association, Wareham (England). River Lab.
M. Ladle, J. A. B. Bass, and W. R. Jenkins.
Hydrobiologia. Vol 29, No 3, p 429-448. 1972. Illus.
Identifiers: Chalk, *Diptera, Food, *Larval stages, Production, Ranunculus-D, Simuliidae, Simulium-equinum, Simulium-ornatum, Stream, *United Kingdom.

Large populations of Simulium ornatum and S. equinum inhabit Ranunclus plants in the Bere Stream at Bere Heath. A weekly sampling program obtained both larvae and pupae. The results of weekly sampling indicated 4 annual generations of S. ornatum and 3 of S. equinum. Quantitative samples of larvae, obtained at least 3 times in each generation gave estimates of production ranging from 0.26 g to 2.75 g dry weight m-2 per generation of larvae of S. equinum ornatum. Retention times of food by larvae, under field conditions were in the order of 20 to 30 min. Following determination of the weight of the gut contents for each size class of larvae, the activity of feeding larvae was calculated to achieve complete theoretical clearance of suspended material in a distance of 0.6 km, at peak population densities in the summer months.--Copyright 1972, Biological Abstracts, Inc.
W73-09535

EFFECT OF THE WASTE-WATER OF SUGAR--WORKS ON NATURAL HISTORY OF THE ZAGYVA RIVER,
Authority Water Conservancy Middle Course Tisza, Szolnok (Hungary).
For primary bibliographic entry see Field 05B.
W73-09538

SEASONAL VARIATIONS IN THE SIZE OF CHIRONOMUS PLUMOSUS L, (IN GERMAN),
Bern Univ. (Switzerland). Zoologisches Institut.
Anna Maria Kloetzli, F. Roemer, and S. Rosin.
Rev Suisse Zool. Vol 78, No 3, p 587-603. 1971. English and French summary.
Identifiers: *Chironomus-Plumosus, Populations, *Seasonal, *Size, *Mosquitos.

During 2 yr measurements of the winglength were carried out on adults of C. plumosus. The material originated from emergence traps and from net-trappings of swarming mosquitoes. A gradual decline of the size leads in both sexes to 3 relatively uniform levels of size during the summer. In autumn a 4th slightly higher level is observed in some places. The seasonal fluctuations of adults and the apparition of the grades of size can be explained by the shallow-water population of the Wohlensee near Berne which develops in 2 generations. Hibernated larvae emerge at the end of April until end of July. This generation extends to the 21st levels of size. The 10 to 15% smaller specimens of the 2nd generation emerge particularly in Aug. and Sept.--Copyright 1972, Biological Abstracts, Inc.
W73-09540

ECOLOGY. THE EXPERIMENTAL ANALYSIS OF DISTRIBUTION AND ABUNDANCE,
For primary bibliographic entry see Field 06G.
W73-09547

EVALUATION OF TWO METHOD OF AERATION TO PREVENT WINTERKILL,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Forestry and Wildlife Science.
R. T. Lackey, and M. Levandowsky.
Prog Fish-Cult. Vol 34, No 3, p 175-178, 1972. Illus.
Identifiers: *Aeration, Fish, Fishery, *Winterkill, *Dissolved oxygen.

Continuous winter aeration and commencing aeration when dissolved O2 reached low levels were compared in their effect on temperature, dissolved O2, and Fe. Continuous winter aeration lowered water temperatures, eliminated thermal gradients, maintained dissolved O2 at high levels, and eliminated Fe buildups. Commencing aeration when dissolved O2 was low had little effect on water temperature, but caused an immediate lowering of dissolved O2 and an increase in Fe. Dissolved O2 slowly increased in concentration after this initial decline. Commencing aeration when dissolved O2 is low, to prevent fish winterkill, should be done cautiously.--Copyright 1973, Biological Abstracts, Inc.
W73-09560

THE 1971 VIRGINIA PESTICIDE STUDY, (PURSUANT TO HOUSE JOINT RESOLUTION 51).
Virginia Dept. of Agriculture and Commerce, Richmond.
(1972), 126 p, 36 tab, 6 append.

Descriptors: *Virginia, *Pesticides, *Pesticide residues, *Monitoring, *DDT, *Water pollution control, *Systems analysis, Public health, Environmental effects, Birds, Legislation.

The Virginia General Assembly initiated an in-depth study of pesticides used in Virginia and their impact on the resources of the State; the full report is presented. Pesticide residue monitoring programs indicate widespread presence of DDT and/or its metabolites. The levels of pesticides residues in water and air did not exceed health standards, however. Occupational hazards for applicators, field workers and people engaged in the manufacture and formulation of pesticides were found to be high. Reproductive failure in several avian species were correlated with DDE and Dieldrin. The report recommends a review system for use of pesticides. Availability of substitute chemical and non-chemical data from residue monitoring and long-term toxicology studies would be readily accessible for decision-making. A systems approach would also be valuable for controlling the use of potentially hazardous pesticides. (Ensign-PAI)
W73-09642

AN ANALOGUE OF THE ARTIFICIAL AERATION OF BASINS (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Institut Kibernetiki.
A. G. Ivakhnenko, and N. V. Gulyan.
Gidrobiol Zh. Vol 8, No 1, p 75-81. 1972. English summary.
Identifiers: *Aeration, *Artificial aeration, Equations, Oxygen, Regression analysis, *River basins.

The obtained regression equation (equation of control) permits calculating the quantity of air which is necessary for each cubic meter of the basin in order to obtain necessary content of O2 in water. For this purpose some characteristics should be given of the basin state for the previous 8 hrs. The equations are true for all basins, which by hydrobiological indices and specific characteristics of aeration systems (specific density of distribution and design of bubblers) are similar to the given one.--Copyright 1972, Biological Abstracts, Inc.
W73-09644

NEW SANITATION RULES: WHAT THEY MEAN,
Marland Environmental Systems, Inc., Wayne, Pa.
W. F. Roberts.
Marine Engineering/Log, p 62-63, 103, November 1972. 2 fig, 2 ref.

Descriptors: *Water quality standards, *Water quality control, Sewage disposal, Ships, *Legislation, Design, Waste treatment, Administrative agencies.
Identifiers: *Compliance time tables.

The Environmental Protection Agency's sanitation standards for the nation's waterways are reviewed. The new regulations are designed to reduce and eventually eliminate the dumping of sewage into rivers, lakes and channels. New vessels must meet the 'no discharge' final standard after two years; existing vessels have a full year compliance time table. Some design methods for sewage storage and/or treatment shipboard are discussed. The quantity of waste water to be handled is a prime consideration in each of the disposal procedures described. The report concludes that the help of a marine engineer/architect or pollution control expert would be advisable since many of the EPA requirements are complex. (Ensign-PAI)
W73-09650

POLLUTION REMEDIES A CONTINENT APART.

World Ports, Vol 34, No 8, p 32, September 1972. 1 fig.

Descriptors: *Oil spills, Oil pollution, *Skimming, *Ships, *Pollution abatement, Technology, Research and development.
Identifiers: *Oil skimmers, Clean-up boats, Oil recovery.

A new oil-skimming device employing a concept called Dynamic Inclined Plane (DIP) is described. The machine works in wind, waves and current, collects sorbents as well as oil and recovers the actual spilled oil rather than oily water. Also discussed is the recent development of a self-contained, automated harbor clean-up craft. The ship is a catamaran with a steel hull and a hydraulic basket at the bow for scooping floating debris out of the water. The boat also has facilities for containing small oil spills. (Ensign-PAI)
W73-09655

ENVIRONMENTAL AND ECONOMIC IMPACT OF RAPID GROWTH ON A RURAL AREA: PALM COAST,
Southeastern Environmental Services, Jacksonville, Fla.
H. P. Bird.
Environmental Affairs, Vol 2, No 1, p 154-171, Spring 1972. 2 fig, 12 ref.

Descriptors: *Florida, *Coasts, *City planning, *Environmental effects, *Saline water intrusion, Human population, Economics, Ecology, Legislation, Urban sociology.
Identifiers: *Palm Coast (Fla).

The Palm Coast city development is assessed as a grave environmental threat. Problems of salt water intrusion, open-ended canals, tree preservation, highway construction and mosquito control are all reviewed. The ITT Community Development Corporation (which is building Palm Coast) is charged with poor planning, misinformation, and possible illegal activities all connected with their proposed city. The social impact of Palm Coast on Flagler County is also examined. The question of tax structure is discussed, along with school facilities and accreditation. The study concludes that much more information is necessary concerning the environmental impact of Palm Coast and that a moratorium on further development should be considered. (Ensign-PAI)
W73-09656

THE ROLE OF THE UN IN ENVIRONMENTAL PROBLEMS,
Columbia Univ., New York.
For primary bibliographic entry see Field 06G.
W73-09659

ADDING THE TIME DIMENSION TO ENVIRONMENTAL POLICY,
Alfred P. Sloan School of Management, Cambridge, Mass.
For primary bibliographic entry see Field 06G.
W73-09660

THE ROLE OF SPECIAL PURPOSE AND NONGOVERNMENTAL ORGANIZATIONS IN THE ENVIRONMENTAL CRISIS,
International Council of Scientific Unions, Rome, (Italy). Special Committee on Problems of the Environment.
For primary bibliographic entry see Field 06G.
W73-09662

THE ROLE OF THE WMO IN ENVIRONMENTAL ISSUES,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 06G.
W73-09663

INTERNATIONAL INSTITUTIONS FOR ENVIRONMENTAL MANAGEMENT,
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06G.
W73-09664

EXPERIENCE IN USING HERBICIDE SIMAZINE FOR CONTROLLING PLANTS IN WATER BODIES, (IN RUSSIAN),
For primary bibliographic entry see Field 04A.
W73-09685

WATER USE CLASSIFICATIONS AND WATER QUALITY STANDARDS.
Georgia Dept. of Natural Resources, Atlanta.

Rules of the Environmental Protection Division, Ga. Code Ann. ch 730-3, 1972. 11 p.

Descriptors: *Water supply development, *Water quality standards, *Georgia, *Water pollution control, *Water quality control, Legal aspects, Administration, Governments, Water treatment, Public health, Water conservation, Reasonable use, Jurisdiction, Environmental effects, Ecology, Administrative agencies, Administrative decisions, Water utilization, Water management (Applied).
Identifiers: *Administrative regulations.

Promulgated for the express purpose of establishing water quality standards, these rules regulate water quality enhancement, water use classifications, general criteria for all waters, specific criteria for classified water usage, natural water quality, waste treatment requirements, stream flows, and mixing zones for effluents. The specific criteria for classified water areas deal with drinking water supplies, recreation, aquatic life, agriculture, industry, navigation, wild rivers, scenic rivers, and urban streams. The purposes and intent of the state of Georgia in establishing water quality standards are to provide enhancement of water quality and prevention of pollution; to protect the public health or welfare in accordance with the public interest for drinking water supplies, conservation of fish, game and other beneficial aquatic life, and agricultural, industrial, recreational, and other beneficial use. The rules indicate that in applying these policies and requirements, the state of Georgia will recognize and protect the interest of the federal government in interstate waters. Toward this end the state will consult and cooperate with the Environmental Protection Agency on all matters affecting the federal interest. (Mockler-Florida)
W73-09692

DEFINITIONS FOR CLEAN WATER COMMISSION REGULATIONS PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.
For primary bibliographic entry see Field 06E.
W73-09693

REGULATIONS FOR PREVENTION OF POLLUTION FROM WELLS TO SUBSURFACE WATERS OF THE STATE PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.
For primary bibliographic entry see Field 06E.
W73-09694

REGULATIONS FOR SINGLE RESIDENCE WASTE WATER TREATMENT DEVICES PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.
For primary bibliographic entry see Field 06E.
W73-09695

SHORTCUT PIPELINE MODIFICATION CONTRA COSTA CANAL UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-09696

LOCAL PROTECTION PROJECT, LOG JAM REMOVAL ON SALAMONIE RIVER NEAR BLUFFTON IN WELLS COUNTY, INDIANA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W73-09700

THE BEACHES: PUBLIC RIGHTS AND PRIVATE USE (PROCEEDINGS OF A CONFERENCE).
Texas Law Inst. of Coastal and Marine Resources, Houston.
For primary bibliographic entry see Field 06E.
W73-09701

A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.
For primary bibliographic entry see Field 06E.
W73-09708

OMNIBUS WATER RESOURCES AUTHORIZATIONS--1972, PARTS I AND II.
For primary bibliographic entry see Field 06E.
W73-09709

ENVIRONMENTAL PROTECTION ACT OF 1971.
For primary bibliographic entry see Field 06E.
W73-09711

PROTECTING AMERICA'S ESTUARIES: PUGET SOUND AND THE STRAITS OF GEORGIA AND JUAN DE FUCA.
For primary bibliographic entry see Field 06E.
W73-09712

PROTECTING AMERICA'S ESTUARIES: PUGET SOUND AND THE STRAITS OF GEORGIA AND JUAN DE FUCA (20TH REPORT).
For primary bibliographic entry see Field 06E.
W73-09713

WATER IMPROVEMENT COMMISSION.
For primary bibliographic entry see Field 06E.
W73-09714

CONSERVANCY DISTRICTS.
For primary bibliographic entry see Field 06E.
W73-09721

WATER SUPPLY.
For primary bibliographic entry see Field 06E.
W73-09724

UNITED STATES V. SKIL CORPORATION (CRIMINAL ACTION AGAINST CORPORATION FOR WATER POLLUTION).
For primary bibliographic entry see Field 06E.

W73-09732

ALKIRE V. CASHMAN (CONSTITUTIONAL CHALLENGE TO STATE STATUTE REQUIRING FLUORIDATION OF MUNICIPAL WATER SUPPLIES).
For primary bibliographic entry see Field 06E.
W73-09733

GEORGIA WATER QUALITY CONTROL ACT.
For primary bibliographic entry see Field 06E.
W73-09738

DELAWARE RIVER BASIN COMPACT.
For primary bibliographic entry see Field 06E.
W73-09746

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

SIMULATION THEORY APPLIED TO WATER RESOURCES MANAGEMENT - PHASE III, DEVELOPMENT OF OPTIMAL OPERATING RULES,
Nevada Univ., Reno. Desert Research Inst.
J. W.Fordham.
Available from the National Technical Information Service as PB-220 352, $3.00 in paper copy, $0.95 in microfiche. Technical Report Series H-W, Publication No 13, 1972. 45 p, 7 fig, 4 tab, 3 append. OWRR C-2153 (3372) (2).

Descriptors: *Planning, *Mathematical models, *Decision making, *Simulation analysis, Reservoir operation, Regression analysis, Synthetic hydrology, Inter-basin transfers, Water allocation, Linear programming, *Nevada, California, Model studies, Water demand, Optimal development plants.
Identifiers: *Truckee River, *Carson River, Out-of-kilter Algorithm.

This project evaluates simulation as a planning and management tool for water resources. This tool was evaluated in the context of Truckee and Carson River System in Nevada and California. A simulation model of the two-river system was constructed which was verified using historical flows and management practices. This simulation model was then embodied in an optimization algorithm to develop 'optimum' operating rules for the system as a whole. Since the demands on the system were incomencerate in economic terms and are greater than the available resource, the problem was resolved into one of allocation of the resource among the various demands. To accomplish this, the problem was formulated as a capacitated flow network and solved using the 'out-of-kilter' algorithm. The reservoir releases and diversions from several flow traces were then subject to multiple regression analysis to determine 'optimal' operating rules for the five reservoirs and for diversions within the system. From the results of the particular runs made it can be said that this two-river multiple time period problem can be approached in this manner and operating rules can be derived which significantly improve overall system operation and satisfy demands to as great as an extent possible. (See also W71-05042)
W73-09118

INTERINDUSTRY ECONOMIC MODELS AND REGIONAL WATER RESOURCES ANALYSES,
For primary bibliographic entry see Field 06B.
W73-09409

ADDING THE TIME DIMENSION TO ENVIRONMENTAL POLICY,
Alfred P. Sloan School of Management, Cambridge, Mass.
For primary bibliographic entry see Field 06G.
W73-09660

6B. Evaluation Process

POSSIBLE WAYS OF DEVELOPING IRRIGATED AGRICULTURE IN SOVIET CENTRAL ASIA AND THE FUTURE OF THE ARAL SEA (VOZMOZHNYYE PUTI RAZVITIYA OROSHAYEMOGO ZEMLEDELIYA SREDNEY AZII I BUDUSHCHEYE ARAL'SKOGO MORYA),
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
For primary bibliographic entry see Field 03F.
W73-09155

STRUCTURE OF WATER CONSUMPTION IN THE UNITED STATES AND ITS SPATIAL CHARACTERISTICS (STRUKTURA VODOPOTREBLENIYA V SSHA I YEYE TERRITORIAL'NYYE OSOBENNOSTI),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 06D.
W73-09156

REMOTE SENSING AS AN AID TO THE MANAGEMENT OF EARTH RESOURCES,
California Univ., Berkeley. Space Sciences Lab.
For primary bibliographic entry see Field 07B.
W73-09262

INTERINDUSTRY ECONOMIC MODELS AND REGIONAL WATER RESOURCES ANALYSES,
E. M. Lofting.
In: Economics of Engineering and Social Systems, John Wiley and Sons--Interscience, New York, New York, p 235-257, 1972. 1 tab, 51 ref.

Descriptors: *Leontief models, *Economic justification, *Regional development, *Regional analysis, Investment, *Decision making, Input-output analysis.
Identifiers: *Interindustry models, Regional investment, Decisions, Investment criteria, Interindustry demand.

Regional investment decisions require a knowledge of the structure of the regional economy, the magnitude and value of commodity imports and exports, and the real value of regional resources that may be necessary to develop. In a survey of methods for regional investment decision-making, the author reviewed the static, open interindustry model as a framework for studying water resource investment. This input-output model requires a regional accounting scheme which can then be used to isolate the dynamic processes of change within a regional economy. This knowledge forms the foundation for investment decisions by indicating the extent to which public projects should be undertaken to meet the input demands of the regional economy. If the satisfaction of effective demand for inputs is considered a benefit, then the input-output framework may be considered a tool for benefit-cost analysis. Methods and feasibility of specific applications were discussed. (Weaver-Wisconsin)
W73-09409

A VALUE-ORIENTED APPROACH TO WATER POLICY OBJECTIVES,
Colorado State Univ., Fort Collins. Dept. of Economics.
A. R. Dickerman.
Land Economics, Vol 48, No 4, p 398-403, November, 1972.

Descriptors: *Cost-benefit theory, *Alternative planning, *Multiple-purpose projects, Decision making, Methodology, *Value.
Identifiers: Value judgement objectives, Ordinal ranking, Choice criteria, Least negative effect.

Benefit-cost analysis is poorly equipped to handle policy targeting problems within a multiobjective framework. New methods such as the PPB system, cost effectiveness studies, and consideration of non-market benefits contribute to the solution of multi-objective problems. These are alternatives to the accepted method of entering value judgement objectives as constraints in an efficiency model. An attempt was made to conceptualize the basic issues associated with water policy formulation and to suggest a pragmatic, analytic thought process to assist in decision making. Starting with a set of postulated values, an ordinal ranking of water-related objectives and goals was derived. The efficiency criteria were then entered as a constraining function in the pursuit of specific goals. This suggested the use of a least negative effect principle in favor of the maximum benefit principle as the basic choice criterion. (Weaver-Wisconsin)
W73-09412

MANAGEMENT OF GROUND WATER,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 04B.
W73-09413

APPRAISAL OF THE WATER AND RELATED LAND RESOURCES OF OKLAHOMA.
Oklahoma Water Resources Board, Oklahoma City, Region Ten.
For primary bibliographic entry see Field 04A.
W73-09599

AN ECONOMIC APPROACH TO LAND AND WATER RESOURCE MANAGEMENT: A REPORT ON THE PUGET SOUND STUDY,
Washington Univ., Seattle. Dept. of Economics.
R. L. Bish.
University of Washington Institute for Economic Research, Report, April 1972. 20 p, 9 ref.

Descriptors: *Washington, *Sounds, Water resources, *Water management (Applied), *Planning, *Water policy, *Competing uses, Administrative agencies, Decision making, Land use.
Identifiers: *Puget Sound, Case studies.

Information is presented on the processes which determine the kinds of land and water uses of Puget Sound. A theoretical framework is developed to analyse these decision-making processes by first evaluating the political and legal structures from which decisions flow and then incorporating economic analyses into the final predictive theory. The central thesis of this new theory is that individuals (rather than abstract organizations) make decisions, and that their decisions are made with the intention of improving their own situation, as they perceive it. Perception of a given situation is the critical area of decision-making. Lack of knowledge, combined with numerous and conflicting uses for a single resource, complicate matters significantly. The theory of individual decision is applied to case studies involving the use of the resources of Puget Sound. (Ensign-PAI)
W73-09646

PROPOSED AMENDMENTS TO THE LAND AND WATER CONSERVATION FUND ACT.
For primary bibliographic entry see Field 06E.
W73-09706

LAND AND WATER CONSERVATION FUND ACT AND RELATED PROGRAMS.
For primary bibliographic entry see Field 06C.

W73-09707

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE ECONOMICS OF INDUSTRIAL WASTE TREATMENT,
Environmental Control Consultancy Services Ltd., London (England).
For primary bibliographic entry see Field 05D.
W73-09410

POLLUTION CONTROL--USES OF CORRECTIVE TAXES RECONSIDERED,
Arizona Univ., Tucson. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W73-09411

LAND AND WATER CONSERVATION FUND ACT AND RELATED PROGRAMS.

Hearings--Subcomm. on National Parks and Recreation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, February 1972. 127 p.

Descriptors: *Federal budget, *National recreation areas, *National parks, *Recreation facilities, *Public access, Facilities, Parks, Public lands, Conservation, National forests, Recreation, Recreation demand, Camp sites, Fishing, Land use, Social impact, Social needs, Water utilization, Federal government, Comprehensive planning, Administrative agencies, Road construction, Area redevelopment, Public benefits, Costs.

Hearings with respect to development in areas within the National Park System were held in February of 1972, to determine whether plans for such public facilities as visitor centers, roads, and campgrounds are being implemented and budgeted for by appropriate federal agencies. Included are statements submitted by various agencies involved in the National Park System and the testimony of agency representatives. Also included are letters and memoranda by legislators and interested agency officials. Tables and schedules relating to such matters as budgeting, development programs, land acquisition, future requirements and environmental impact data are dispersed throughout the report. (Dunham-Florida)
W73-09707

6D. Water Demand

STRUCTURE OF WATER CONSUMPTION IN THE UNITED STATES AND ITS SPATIAL CHARACTERISTICS (STRUKTURA VODOPOTREBLENIYA V SSHA I YEYE TERRITORIAL'NYYE OSOBENNOSTI),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
M. Ye. Polovitskaya.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 1, p 77-92, January-February 1972. 5 fig, 8 tab, 10 ref.

Descriptors: *United States, *Water utilization, *Water consumption (Except consumptive use), *Consumptive use, Water users, Water demand, Water requirements, Water supply, Water resources, Water resources development, Water pollution, Water pollution sources, Water pollution control, Agriculture, Industries, Economics, Projections, Forecasting.
Identifiers: *USSR.

It has been estimated that 10% of the national wealth of the United States is found in capital structures designed to collect, divert, and store surface water, distribute it where needed, cleanse it, and return it to the natural system. Of the 20 water resources regions in the United States in 1965, five (North Atlantic Region, Great Lakes Region, Ohio Region, Columbia-North Pacific Region, and California Region) accounted for 58.5% of the nation's water withdrawals; three regions (South Atlantic-Gulf, Texas-Gulf, and Missouri) accounted for 21%; and the remaining 12 regions for 20.5% of the total withdrawal. Withdrawals for the first five regions are expected to grow to 67% by 2020. In 1965, streams supplied 67%, groundwater aquifers 22%, and saline sources, most of which were from the ocean, 11% of the nation's water withdrawals. Groundwater supplies are used primarily for irrigated agriculture (66%), urban water supply (14%), and industrial water supply (14%). The three most important users of water are irrigated agriculture (41%), the thermal electricity generating industry (31%), and the manufacturing industries (17%). A division of the conterminous United States into 6 regions according to water resources adequacy and development needs is based on comparison of current water supplies with projections of water withdrawal requirements. (Josefson-USGS)
W73-09156

THE RELATION OF FORESTS AND FORESTRY TO WATER RESOURCES,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 04A.
W73-09537

PUBLIC ACCESS TO RESERVOIRS TO MEET GROWING RECREATION DEMANDS.
For primary bibliographic entry see Field 06E.
W73-09710

6E. Water Law and Institutions

A LOOK BACK AT THE FIRST SEVEN YEARS OF WYO. WRRI (1965-1971),
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 09A.
W73-09108

A PROPOSAL FOR IMPROVING THE MANAGEMENT OF THE GREAT LAKES OF THE UNITED STATES AND CANADA.
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

Available from the National Technical Information Service as PB-220 359, $3.00 in paper copy, $0.95 in microfiche. Canada--United States University Seminar, 1971-1972, Technical Report No 62, January 1973. OWRR C-2145 (3370) (1).

Descriptors: *Great Lakes Region, *Institutions, *International waters, *Canada, *United States, *International Joint Commission, Comprehensive planning, International law, Land management, Multiple purpose, Water management (Applied), Organizations.
Identifiers: Large lakes.

A study of the management of the Great Lakes was undertaken by the Canada-United States University Seminar in 1971-1972. The Seminar, a binational group composed of faculty members representing some twenty Canadian and U.S. universities in the Great Lakes region, explored ways in which the management of the water and related land resources of the Great Lakes Basin might be strengthened to the mutual advantage of both countries. The investigation was concerned with determining what kinds of government organizations are needed and how these organizations should be related to one another in order to achieve effective management of the natural resources of the Great Lakes Basin at the lowest possible economic, political and social costs. The report proposes that the United States and Canada must act individually and jointly, to remove such obstacles. The report considers: The current resource use situation in the Great Lakes; the International Joint Commission (IJC), its structure and functions, and an assessment of the Commission; general specifications for an enhanced institutional structure for the Great Lakes; and alternative institutional arrangements. Resulting from the Seminar was general agreement on the need for substantial changes in the present institutional framework. Two alternatives were identified: (1) to introduce organizational improvements within a considerably strengthened International Joint Commission; and (2) to establish by treaty new organizational arrangements distinct from the IJC. (Bell-Cornell)
W73-09110

DIRECTORY OF FACULTY ENGAGED IN WATER RESEARCH AT CONNECTICUT UNIVERSITIES AND COLLEGES,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 09A.
W73-09112

SOUND WASTE MANAGEMENT CUTS OFFSHORE COSTS,
Weston (Roy F.), Inc., West Chester, Pa. Marine Waste Management Div.
For primary bibliographic entry see Field 05G.
W73-09224

SEA FISHERIES COMMITTEES,
Manchester Univ. (England). Faculty of Law.
For primary bibliographic entry see Field 05G.
W73-09226

CALIFORNIA TIGHTENS CLAMP ON EFFLUENTS,
For primary bibliographic entry see Field 05G.
W73-09230

WATER AND WASTEWATER PROBLEMS IN RURAL AMERICA.
Commission on Rural Water, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-09264

WATER RESOURCES RESEARCH AT THE UNIVERSITY OF MARYLAND, 1965-1972,
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 09A.
W73-09267

MANAGEMENT OF GROUND WATER,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 04B.
W73-09413

TIDAL DATUM PLANES AND TIDAL BOUNDARIES AND THEIR USE AS LEGAL BOUNDARIES -- A STUDY WITH RECOMMENDATIONS FOR VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02L.
W73-09609

THE 1971 VIRGINIA PESTICIDE STUDY, (PURSUANT TO HOUSE JOINT RESOLUTION 51).
Virginia Dept. of Agriculture and Commerce, Richmond.
For primary bibliographic entry see Field 05G.
W73-09642

NEW SANITATION RULES: WHAT THEY MEAN,
Marland Environmental Systems, Inc., Wayne, Pa.
For primary bibliographic entry see Field 05G.
W73-09650

THE UNITED NATIONS AND THE ENVIRONMENT,
Conference on the Human Environment, New York.
For primary bibliographic entry see Field 06G.
W73-09658

THE UNITED NATION'S INSTITUTIONAL RESPONSE TO STOCKHOLM: A CASE STUDY IN THE INTERNATIONAL POLITICS OF INSTITUTIONAL CHANGE,
Sussex Univ., Brighton (England). Inst. for the Study of International Organization.
For primary bibliographic entry see Field 06G.
W73-09661

THE ROLE OF SPECIAL PURPOSE AND NONGOVERNMENTAL ORGANIZATIONS IN THE ENVIRONMENTAL CRISIS,
International Council of Scientific Unions, Rome, (Italy). Special Committee on Problems of the Environment.
For primary bibliographic entry see Field 06G.
W73-09662

INTERNATIONAL INSTITUTIONS FOR ENVIRONMENTAL MANAGEMENT,
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06G.
W73-09664

WATER USE CLASSIFICATIONS AND WATER QUALITY STANDARDS.
Georgia Dept. of Natural Resources, Atlanta.
For primary bibliographic entry see Field 05G.
W73-09692

DEFINITIONS FOR CLEAN WATER COMMISSION REGULATIONS PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.

Hearing of Clean Water Commission--Definition for Regulations presented March 21, 1973. 2 p.

Descriptors: *Water quality, *Administration, *Water quality standards, *Missouri, Water pollution, Water law, Waste water, Water pollution treatment, State governments, Administrative agencies, Administrative decisions, Regulation, Water pollution control, Wells, Aquifer, Cesspools, Effluents, Sewerage, Sinks, Waste water (Pollution), Waste water treatment.
Identifiers: *Administrative regulations, *Definitions, Engineers, Well plugging, State waters.

This document contains definitions for Clean Water Commission regulations as promulgated by the Missouri Clean Water Commission. One of the more important terms defined is pollution, described as such contamination or other alteration of the physical, chemical or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or is reasonably certain to create a nuisance or render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, industrial, agricultural, recreational, or other legitimate beneficial uses, or to wild animals, birds, fish or other aquatic life. Other defined terms include abandoned well, agency, aquifer, cesspool, effluent, engineer, plugging, sewer system, single family residence, single residence waste water treatment device, sinkhole, waste waste, waste water treatment facility, waters of the state, well, and well owner. (Mockler-Florida)
W73-09693

REGULATIONS FOR PREVENTION OF POLLUTION FROM WELLS TO SUBSURFACE WATERS OF THE STATE PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.

Regulations of March 21, 1973. 1 p.

Descriptors: *Missouri, *Regulation, *Oil wastes, *Waste water (Pollution), *Waste water disposal, Subsurface waters, Wells, Water pollution, Legal aspects, Drainage, Underground streams, Aquifers, Water quality control, mining, Water pollution control, Administrative agencies, Administrative decisions, Water resources development, Water management (Applied), Well regulation.
Identifiers: *Administrative regulations, *Well plugging.

No person shall release any waste water into the subsurface waters of the state, or store or dispose of such waste water in any way which causes or permits it to enter the subsurface waters of the state directly or indirectly. Moreover, no waste water shall be introduced into sinkholes, caves, fissures, or other openings in the ground which do or are reasonably certain to drain into aquifers. Whenever any well is abandoned, it shall be plugged or sealed as necessary to prevent pollution of subsurface waters of the state. An affidavit detailing the procedure used in plugging is required to be filed with the Missouri Clean Water Commission. It shall not be a violation to return oil field wastes to oil producing formations from which they were obtained or backfill cavities as an integral part of a mining operation with aggregate or other material obtained from that operation to either reduce accumulation of wastes on the surface or to provide additional ground support in the mined out area or to inundate such cavities with water devoid of toxic materials. (Mockler-Florida)
W73-09694

REGULATIONS FOR SINGLE RESIDENCE WASTE WATER TREATMENT DEVICES PRESENTED AT HEARING ON MARCH 21, 1973.
Missouri Clean Water Commission, Jefferson City.

Regulations of March 21, 1973. 2 p.

Descriptors: *Regulation, *Waste water treatment, *Waste water disposal, *Missouri, *Water pollution control, Legal aspects, Sewage disposal, Water treatment, Water pollution sources, Waste disposal, Water management (Applied), Administrative agencies, Effluents, Waste water (Pollution), Sanitary engineering, Sewerage, Environmental effects.
Identifiers: *Administrative regulations.

When a single family residence is located in an area where a public or privately owned sewer system is not available, the owner must construct a waste water treatment device in accordance with the Missouri Clean Water Commission (Commission) regulations. If such a sewer system becomes available within 150 feet of the owner's property line, his waste water treatment system must be abandoned and a connection made to the sewer system within one year thereafter. The waste water treatment device must be a minimum of 50 feet from the nearest property line. If the owner wishes to install a waste water treatment device on a lot less than three acres in size, permission must be obtained from the Commission, and in no event may such a device be installed on a lot less than one acre in size. Effluents from these waste water treatment devices shall be contained within the owner's property line and may not be released into waters of the state. Special requirements relating to residences in subdivisions, construction requirements, and location of waste water treatment devices are also mentioned. (Mockler-Florida)
W73-09695

THE BEACHES: PUBLIC RIGHTS AND PRIVATE USE (PROCEEDINGS OF A CONFERENCE).
Texas Law Inst. of Coastal and Marine Resources, Houston.

Available from National Technical Information Service, U.S. Department of Commerce, PB-212 901, for $3.00 paper copy and $0.95 microfiche. Proceedings of a conference held January 15, 1972. 74 p, 12 ref.

Descriptors: *Texas, *Legislation, *Beaches, *Coastal land use, *Public rights, Shoreline boundary, Legal aspects, Water resources development, Competing uses, Project planning, Water law, Relative rights, Recreation, Recreation facilities, Public access, Public lands, Public benefits, Easements, Water utilization, Water policy, Prescriptive rights.
Identifiers: *Coastal zone management, Ingress, Egress.

A conference was held in January 1972 to discuss public rights and private use of beaches along the Texas coast. This report summarizes Texas law of the beaches and reports by participants which suggested necessary amendments to the Open Beaches Act (Act) to make it more protective of the public rights. Although the conference was not aimed at reaching any specific conclusions, the discussions did point out that the Texas Open Beaches Act may not guarantee the public a right to use all beaches; but, where such rights exist, state and local regulations are desirable to assure orderly development of public use. The Open Beaches Act was enacted to reduce to statutory language some common law concepts that recognize certain public rights to use the beaches. The act directs the Attorney General to protect the people's right, defined as a right of ingress and egress to that portion of the beach owned by the state and also to that part of the beach impressed with a presumption of a right of use by the people. Moreover, the Act provides for a presumption of prescriptive right to the area between low tide and, generally, the vegetation mark. There is also a discussion of the proposed National Open Beaches Act and actions taken by other coastal states. (Mockler-Florida)
W73-09701

WATERSHED FIELD INSPECTIONS--1971.

Hearings--Subcomm. on Conservation and Watershed Development--Comm. on Public Works, U.S. House of Representatives, 92d Cong, 1st Sess, 1971. 545 p, 2 fig, 4 tab, 4 chart.

Descriptors: *Flood control, *Watershed management, *Water resources development, *Water utilization, *Water management (Applied), Federal government, Erosion control, Land management, River basin development, Soil management, Water conservation, Water storage, Water supply, Water yield improvement, Watersheds (Basins), Water sources, Channel improvement, Legislation, Project planning, Environmental effects, Recreation basins.

Hearings were held in various communities between July and November of 1971 located in

areas of selected projects where the need for watershed development is great--Ardmore, Oklahoma; Princeton, West Virginia; Macon, Georgia; Greenville, Mississippi; Davenport, Iowa; and Wichita, Kansas. The purpose of the hearings was to gain the knowledge necessary for future legislation in watershed development, especially in light of attacks by conservationists on the watershed programs, particularly in the area of channel improvement. Included are statements and testimony of various interested groups and individuals represented at the hearings. Also included are graphs, tables and charts relating to specific watershed development programs. (Dunham-Florida)
W73-09704

PROPOSED UPPER MISSISSIPPI RIVER NATIONAL RECREATION AREA.
Hearings--Subcomm. on National Parks and Recreation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92d Cong, 2d Sess, March 25 and June 19, 1972. 118 p.
Identifiers: *National recreation areas, *Mississippi River Basin, *Recreation facilities, *Multiple-purpose projects, Social needs, Mississippi River, Illinois, Iowa, Minnesota, Missouri, Wisconsin, Recreation, Economics, Land use, Natural resources, Recreation demand, Scenery, Social aspects, Social impact, Water policy, Legislation.

In March and June of 1972, hearings were held on related bills which, if enacted, would provide for the establishment of the Upper Mississippi River National Recreation Area. The proposed area would include the Mississippi River and portions of the first tier of counties along the river in the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin; it would consist of some 650,000 acres of land and water extending 660 miles along the river. The hearings were held to obtain the views of those persons who have indicated an interest in the proposed legislation. Included in the report are texts of the bills, reports by the Department of the Interior and the General Service Administration, statements and testimony of persons representing various interested groups, both in and outside the government, and letters expressing views on the bills. The letters and statements represent opinions both for and against the proposed recreational development. (Dunham-Florida)
W73-09705

PROPOSED AMENDMENTS TO THE LAND AND WATER CONSERVATION FUND ACT.

Hearings--Subcomm. on National Parks and Recreation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, 92d Cong, 1st Sess, May 1971. 353 p.

Descriptors: *National recreation areas, *Recreation facilities, *Comprehensive planning, *Financing, Public lands, Economics, Recreation, Project planning, Project purposes, Water policy, Conservation, Water conservation, Land management, Natural resources, National parks, Government finance, Administration, Recreation demand, Resource allocation, Resources.
Identifiers: *Golden Eagle Passport program, *Land and Water Conservation Fund Act.

These hearings were held to discuss proposed legislation to amend the Land and Water Conservation Fund Act of 1965 (LWCFA). The first bill would authorize a lifetime entrance permit to any federal recreation area to be issued to any person over 64 and for $25. The second bill would exempt all persons over 64 from paying any entrance or admission fee in any federal recreation area. The third bill embodies the administration's recommendations for the revision and extension of the Golden Eagle Passport program which is the popular name given to the federal uniform annual entrance permit authorized by the LWCFA. The fourth bill represents an alternative and substantial departure from the Golden Eagle program. Texts of the bills; reports from federal agencies; statements, testimony, and letters from interested groups within and outside the government are included along with a series of tables related to federal recreation fees and their use in land and water conservation. (Dunham-Florida)
W73-09706

A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.

Report--Environmental Protection Agency, Office of Water Programs, March 1972. 209 p, 4 fig, 16 tab, 9 chart.

Descriptors: *Federal Water Pollution Control Act, *Manpower, *Training, *Forecasting, Federal government, Administrative agencies, Estimating, Evaluation, Future planning (Projected), Employment opportunities, Personnel, Occupations, Personnel management, Scientific personnel, Professional personnel, Schools (Education), Water pollution control, Comprehensive planning, Control, Regulation.

This report focuses on the manpower development activities of all organizations, both public and private, that are concerned with water pollution control. The report is made in response to a requirement of the Federal Water Pollution Control Act. It is divided into three main areas: (1) manpower planning; (2) manpower recruitment, retention and utilization; and (3) manpower training. Actions taken to develop a forecasting system for manpower and training needs and interim estimates of future needs are included. There is a discussion of the extent and effectiveness of both the Environmental Protection Agency, (EPA), and non-EPA training programs in the field of water pollution control. A projection of manpower and training needs until 1976 in the three principal water pollution control manpower categories of operators, technicians, and professionals is also included. Various charts, graphs and tables accompany the report. (Dunham-Florida)
W73-09708

OMNIBUS WATER RESOURCES AUTHORIZATIONS--1972, PARTS I AND II.
Hearings--Subcomm. on Flood Control--River and Harbors--Comm. on Public Works, U.S. Senate, 92d Cong, 2d Sess, June 1972. 821 p, 6 fig, 3 map, 41 photo, 19 tab, 11 chart, 2 append.

Descriptors: *Federal government, *Water resources development, *Water policy, *Water utilization, Administration, Comprehensive planning, Conservation, Legislation, Multiple-purpose projects, Natural resources, Optimum development plans, Potential water supply, Project purposes, Research and development, Water allocation (Policy), Water conservation, Water requirements, Water resources, Water supply, Flood control, Recreation facilities, Environmental effects.

These hearings were initiated for the purpose of determining the necessity of legislation authorizing the construction of federal water resources projects for navigation, water supply, flood control, recreation facilities, conservation, beach erosion control and water utilization. The Army Corps of Engineers presented reports of on-going projects and proposals for the further development and conservation of the Nation's water resources. Also included are statements and testimony of witnesses at the hearing, texts of proposed legislation, letters and commentaries by various groups and individuals interested either in particular projects or future water resources development at the federal level. Charts, maps, and tables are interspersed through the report. (Dunham-Florida)
W73-09709

PUBLIC ACCESS TO RESERVOIRS TO MEET GROWING RECREATION DEMANDS.
House of Representatives Report No. 279, 92d Cong, 1st Sess, October 21, 1971. 38 p.

Descriptors: *Federal project policy, *Artificial lakes, *Reservoir design, *Public access, *Recreational facilities, Federal government, Administrative agencies, Reservoir construction, Reservoir sites, Reservoirs, Reservoir operation, Competing uses, Recreation, Water management (Applied), Wildlife management, Multiple-purpose reservoirs, Conservation, Lakes, Recreation demands, Access routes, Public benefits, Public lands, Legislation, Administrative decisions.
Identifiers: Environmental impact statements.

Based on hearings held before the U.S. House Subcommittee on Conservation and Natural Resources, this report examines whether federal agencies which constrict or finance the construction of reservoir lakes are complying with congressional outdoor recreation policy of providing public access to such reservoirs. After brief analyses of efforts by several federal agencies to comply with the above policy the report concludes that the changes made by the U.S. Army Corps of Engineers (Corps) concerning the 1962 Joint Reservoir Land Acquisition Policy should be promptly rescinded. No changes in the joint policy or its implementation should be made either by the Corps or the Bureau of Reclamation without (1) providing public notice of the proposed change; (2) holding public hearings; and (3) following the requirements of the National Environmental Policy act by preparing an environmental impact statement and consulting with agents having special interest or expertise with respect to the effects of such changes. (Dunham-Florida)
W73-09710

ENVIRONMENTAL PROTECTION ACT OF 1971.

Hearing--Subcomm. on the Environment--Comm. on Commerce, United States Senate, 92d Cong, 1st Sess, September 27, 1971. 294 p.

Descriptors: *Legislation, *Environmental protection, *Federal government, *Legal review, Governments, Water law, Water resources development, Water pollution, Air pollution, Regulation, Legal aspects, Federal jurisdiction, Pollution abatement, Pollutants, Ecology, Environmental control, Public health, Public benefits.
Identifiers: *Environmental Protection Act of 1971.

Hearings were held in September of 1971 to take testimony on the Environmental Protection Act of 1971. The bill, which seeks to facilitate environmental lawsuits, overcomes the defense of sovereign immunity and provides a remedy for all citizens when the administrative process does not give the environment the protection it requires. The bill would serve to promote and protect the free flow of interstate commerce without unreasonable damage to the environment, assure that activities which affect interstate commerce will not unreasonably injure environmental rights, provide a right of action for relief for protection of the environment from unreasonable infringement by activities which affect interstate commerce and to establish the right of all citizens to the protection, preservation, and enhancement of the environment. Witnesses appearing before the subcommittee included Ralph Nader and representatives of Common Cause and General Electric Co. Additional articles, letters, and statements provided by individuals, private groups, and federal agencies interested in the proposed legislation are included. (Mockler-Florida)
W73-09711

PROTECTING AMERICA'S ESTUARIES: PUGET SOUND AND THE STRAITS OF GEORGIA AND JUAN DE FUCA.

Hearings–Subcomm. of the Comm. on Government Operations, United States House of Representatives, 92d Cong, 1st Sess, December 10, 11, 1971. 727 p, 14 fig, 1 map, 17 tab.

Descriptors: *Environmental effects, *Resources development, *Administrative agencies, *Estuaries, *Estuarine environment, Sounds, Water law, Competing uses, Governmental interrelations, Laws, Dredging, Flood control, Ecology, Wildlife conservation, Wildlife management, Federal government, Comprehensive planning, Administrative decisions, Regulation, Oil fields.
Identifiers: *Puget Sound, Coastal zone management, Administrative regulations.

Hearings were held before the House Subcommittee on Government Operations with reference to protecting the Puget Sound estuary. The report indicates the Puget Sound region is probably the most important resource of the Pacific Northwest. It abounds with wildlife and is the principal wintering area for waterfowl from British Columbia, the Northwest Territories, Alaska, and eastern Russia. At the hearings, the subcommittee testimony on whether the various federal agencies are responsibly, imaginatively, economically, and efficiently carrying out their responsibilities under existing laws, executive orders and directives to protect the environmental quality of the Puget Sound area. One matter of concern to the Subcommittee was the increasing use of the Puget Sound area for the transportation and production of oil. Moreover, the Subcommittee wanted to learn the extent to which dredging and filling, including Army Corps of Engineers maintenance dredging, has caused problems. The Subcommittee was also interested in learning the extent to which dredging in harbors is being used as a substitute for effective treatment of wastes. (See also W73-09713) (Mockler-Florida)
W73-09712

PROTECTING AMERICA'S ESTUARIES: PUGET SOUND AND THE STRAITS OF GEORGIA AND JUAN DE FUCA (20TH REPORT).

Comm. on Government Operations, U.S. House of Representatives, Report No. 731, 92d Cong, 2d Sess, September 18, 1972. 83 p.

Descriptors: *Estuarine environment, *Federal government, *Water pollution control, *Water pollution sources, Legislation, Water pollution, Waste water disposal, Industrial wastes, Environmental effects, Aquatic habitats, Sounds, Washington, Estuaries, Oil pollution, Oil spills, Pulp wastes, Sewage treatment, Ecology, Administrative agencies, Water resources development, Water management (Applied).
Identifiers: *Puget Sound.

This current report is directed to the question of whether federal agencies, in cooperation with state and local agencies, are giving adequate consideration to the effects of their activities in the Puget Sound area and whether they are developing means to avoid or mitigate harmful effects wherever possible. Specifically the report finds a heightened increase in the risk of oil spills due to an increase in the petroleum industry and failure of federal agencies to carry out existing law and policy, regulations regarding sewage discharge from vessels have not been formulated as required, a state agency unilaterally extended pollution control schedules for pulpmills in violation of federal water quality standards, the Refuse Act has not been enforced adequately or uniformly, and the state of Washington is developing legislation which may help minimize damage to Puget Sound and other state shorelines and estuaries. A list of recommendations for the various agencies involved is included. (See also W73-09712) (Mockler-Florida)
W73-09713

WATER IMPROVEMENT COMMISSION.

Ala. Code tit. 22, secs. 140 (1) thru 140 (12g) (Supp 1971).

Descriptors: *Alabama, *Legislation, *Water pollution control, *Administrative agencies, Water resources development, Water utilization, Water permits, Water pollution treatment, Water quality, Water purification, Water quality standards, Federal Water Pollution Control Act, Water management (Applied), Permits, Governments, Regulation, Administrative decisions, Environmental effects, Adjudication procedure, Legal review.
Identifiers: Notice, Administrative regulations.

To carry out the declared public policy to improve and conserve the waters of the state and to prevent water pollution, the Water Improvement Commission (Commission) is created. The Commission is empowered to investigate, research and prepare programs pertaining to the purity and conservation of state waters. The Commission is authorized to promulgate rules, regulations and orders in furtherance of state policy and to issue licenses or permits to insure water quality standards. Provisions for the composition and administration of the Commission are listed. The Commission is required to hold hearings prior to taking specific action with an appeal procedure provided for affected parties. Penalties are provided of orders or permit requirements. The Commission is designated the state water pollution control agency as required by the Federal Water Pollution Control Act, and is authorized to work in cooperation with agencies within the federal government on matter of mutual interest. (Dunham-Florida)
W73-09714

COMPREHENSIVE LAND MANAGEMENT AND USE PROGRAM IN FLOOD PRONE AREAS.

Ala. Code tit. 12, secs. 341 thru 364 (Supp 1971).

Descriptors: *Alabama, *Legislation, *Flood control, *Land management, *Flood plain zoning, Zoning, Flood damage, Flood protection, Water management (Applied), Building codes, Local governments, Land management, Land resources, Land use, Ecology, Administration, Administrative decisions, Regulation, Legal aspects, Adjudication procedure, Legal review, Penalties (Legal), Comprehensive planning.
Identifiers: Subdivision regulation.

To reduce the damaging effects of flooding, each county in the state may be provided with a comprehensive land-use management plan by: (1) regulating the development of land in flood-prone areas; (2) guiding the development of proposed construction away from locations threatened by flood hazards; (3) assisting in reducing damage caused by floods; and (4) improving long-range management and use of flood prone areas. Each county governing body is authorized to adopt zoning ordinances and building codes for such flood prone areas in accordance with the above policies. The county government may also create a planning commission for enforcing these provisions. The organizational structure and powers of the commission are listed. Anyone desiring to develop flood prone lands may be required to submit plans to the county. Provisions for hearings and appeal of decisions to a board of admustment, which is required to be set up by the county government to adjudicate problems arising in implementing these provisions, are provided. Special provisions for regulation of subdivisions in flood prone areas are also included. (Dunham-Florida)
W73-09715

WATER CONSERVATION AND IRRIGATION AGENCIES.

Ala. Code tit. 12, secs. 297 (1) thru297 (14) (Supp 1971).

Descriptors: *Alabama, *Legislation, *Water conservation, *Irrigation districts, Irrigation, Irrigated land, Irrigation efficiency, Water delivery, Water requirements, Irrigation systems, Irrigation programs, Irrigation water, Water allocation (Policy), Water utilization, Water supply development, Water resources development, Administration, Governments, Permits, Bonds, Governmental interrelations.

In the interest of water conservation and land irrigation the legislature authorizes the establishment of an incorporated state development agency constituting an irrigation district or districts for the state. The membership of the corporation shall consist of title holders to the land irrigated or porposed to be irrigated within the boundaries of the district or districts to be established; such members shall elect a board of directors. Provisions for incorporation and the management structure are set forth. The powers of the corporation are enumerated. The corporation is required to obtain permits from the Department of Conservation prior to any project construction. Contracts awarded by the corporation must be on the basis of competitive bids. The corporation is authorized to issue bonds to finance proposed projects. No officer of the corporation may have an interest in any contract awarded. The corporation is required to cooperate with other state agencies in the development of irrigation and water conservation. (Dunham-Florida)
W73-09716

WATER RESOURCES RESEARCH INSTITUTE.
Ala. Code tit. 8, secs. 266 thru 269 (Supp 1971).

Descriptors: *Research and development, *Research facilities, *Alabama, *Legislation, *Water resources development, *Investigations, Water resources, Water sources, Water supply, Natural resources, Optimum development plans, Project purposes, Water allocation (Policy), Water conservation, Water policy, Administration, Governments, Ecology, Grants.

In order to help assure the state policy of the legislature to provide an abundance of water, both as to quality and quantity, the Board of Trustees of Auburn University may establish a water resources research institute or center which is designated as the state agency to accept federal funds for the use of such centers. The institute will be under the control of the trustees and president of Auburn University. It shall be the duty of the institute to research, investigate and experiment in the field of water and resources as they affect water, and to encourage the training of scientists in this field. The result of the institute's research shall be published as determined by the director of the institute. The provisions are not intended to restrict or duplicate programs conducted by the Geological Survey of Alabama or the University of Alabama in the area of water resources. (Dunham-Florida)
W73-09717

SEAFOODS.
Ala. Code tit. 8, secs. 130 (1) thru 164 (5) (Supp 1971).

Descriptors: *Alabama, *Legislation, *Shellfish farming, *Regulation, Marine animals, Mussels, Oysters, Mollusks, Shrimp, Shellfish, Commercial shellfish, Aquatic animals, Crustaceans, Commercial fishing, Beds, Reefs, Baits, Permits, Administration, Administrative agencies, Administrative decisions, Legal aspects, Governments, Penalties (Legal).

Identifiers: *Licenses, Oyster beds, Culling, Rake dredges, Seed oysters.

Under the Department of Conservation regulations are provided for control over the cultivation, harvesting, catching and selling of oysters, shrimp and mussel or mollusks in the waters of the state. Specifications for the culling of oysters, matters pertaining to seed oysters, the use of mechanical rake dredges, minimum size requirements, and replanting oysters are listed. Licensing for shrimp boats, minimum weight requirements, licensing of sale of shrimp for bait and the registration of boats used in catching shrimp are regulated. The Director of Conservation is empowered to promulgate and establish as to when, where, and how and under what conditions mussels or mollusks may be caught or taken from the fresh waters of the state. Provisions are included for the licensing of mussel buyers and mussel catchers. Penalties for the violation of any of these provisions are set forth. (Dunham-Florida)
W73-09718

COOSA VALLEY DEVELOPMENT AUTHORITY.

Ala. Code tit. 38, secs. 141 thru 155 (Supp 1971).

Descriptors: *Alabama, *Legislation, *Inland waterways, *Bond issues, *Administrative agencies, Channels, Surface waterways, Administrative decisions, Water management (Applied), Comprehensive planning, Water resources, Water utilization, Governments, Policy planning, Surface water availability, Water policy, Conservation, Agriculture, Industry, Transportation, Navigation.
Identifiers: *Public corporations.

To implement the construction of a navigable waterway between Montgomery and Gadsden and to the Alabama-Georgia boundary providing a new transportation route to stimulate the development of commerce, agriculture, and industry, the legislature authorizes the formation of a public corporation. The corporation is authorized to undertake all obligations and perform all actions necessary to the project located in the Coosa River Basin. Provisions for establishing the corporation are provided, and the corporation is authorized to issue bonds to finance the project with specific provisions as to issuance of and application of bond proceeds. A provision for dissolution of the public corporation when no duties or obligations remain is included. (Dunham-Florida)
W73-09719

TENNESSEE-MULBERRY WATERWAY COMMISSION

Ala. Code tit. 38, secs. 127 thru 130 (Supp 1971).

Descriptors: *Alabama, *Legislation, *Inland waterways, *Administrative agencies, Channels, Surface waterways, Lakes, Rivers, Administrative decisions, Water management (Applied), Comprehensive planning, Water resources, Water utilization, Governments, Water policy, Tennessee River, Transportation, Navigation.

The Tennessee-Mulberry Water Commission (Commission), is established to promote and develop a waterway system in Alabama connecting Guntersville Lake on the Tennessee River with Bankhead Lake on the Warrior River utilizing Mulberry Fork and Brown's Creek as part of the water route. Provisions for the composition and administration of the Commission are listed. The Commission is authorized to hold hearings, make surveys and reports, to handle the holding and disposing of money and property, and to exercise such other powers appropriate to accomplish its functions and duties in connection with the devlopment of the waterway. A provision for the dissolution of the Commission upon completion of its work is included. (Dunham-Florida)
W73-09720

CONSERVANCY DISTRICTS.
Ind. Ann. Stat. secs. 27-1501 thru 27-1599 (1970).

Descriptors: *Water conservation, *Water districts, *Legislation, *Indiana, *Flood control, Water resources development, Legal aspects, Drainage, Irrigation, Water quality standards, Sewage disposal, Economics, Jurisdiction, Administrative agencies, State governments, Comprehensive planning, Regulation, Administration, Financing, Governmental interrelations, Legal review, Water pollution control.

Conservancy districts may be established for flood prevention and control, improving drainage, providing for irrigation, providing water supply (including treatment and distribution for domestic, industrial, and public use), and providing for the collection, treatment and disposal of sewage and other liquid wastes. The express policy of this act is to enable the owners of land to organize special districts with power to tax and with other necessary powers to effect maximum beneficial utilization that can be made of the water resources of the state. The purposes of the act may be accomplished by cooperating with federal and state agencies whose programs are designed to accomplish any of the purposes of the district. Provisions relating to the establishment, administration, membership of the district's board and project financing are included with guidelines and requirements for hearings and appeal procedures by landowners affected either by the creation of a conservancy district or projects approved by the district's board of directors. (Mockler-Florida)
W73-09721

OHIO RIVER AREA COORDINATING COMMISSION.
Ind. Ann. Stat. secs. 68-1301 thru 68-1304 (Supp. 1972).

Descriptors: *Indiana, *Ohio River, *Legislation, *Comprehensive planning, *Governmental interrelations, Navigation, Project purposes, Interstate rivers, Evaluation, Economics, Social aspects, Water pollution control, Environmental effects, Economic impact, Social impact, Legal aspects, Regulation, Planning, Rivers, Administrative agencies, State governments, Public benefits.
Identifiers: *Economic opportunities.

The Ohio River Area Coordinating Commission (Commission) is established, and the means by which its members are to be selected is specified. The Commission is to make annual reports to the state legislature of the problems and economic opportunities arising from the modernization of navigation facilities on the Ohio River along the southern border of Indiana. The statute also provides that the Commission shall encourage and attempt to coordinate the activities of the state of Indiana and agencies thereof with the activities of federal agencies, agencies of other states bordering on the Ohio River, private agencies and private individuals interested in promoting the economy and welfare of the entire Ohio River area. (Reed-Florida)
W73-09722

INDIANA PORT COMMISSION.

Ind. Ann. Stat. secs. 68-1201 thru 68-1238 (Supp. 1972).

Descriptors: *Indiana, *Legislation, *Port authorities, *Channels, Administrative agencies, Administrative decisions, Construction, Erection, Administration, Legal Aspects, Water utilization, Transportation, State governments, Federal government, Planning, Permits, Regulation, Economics, project planning, Leases, Canals, Public benefits, Harbors.
Identifiers: *Foreign trade zones, *Public ports, Administrative regulations.

The Indiana Port Commission (Commission) is authorized to construct, maintain and operate, in cooperation with the federal government, or otherwise, at such location on Lake Michigan and/or the Ohio River, and/or the Wabash River, as shall be approved by the governor, public ports with terminal facilities and traffic exchange points for all forms of transportation. The powers and duties of the Commission and the general powers to prepare and operate a port are specified. The Commission is authorized to acquire by purchase any interest in land as it may deem necessary or convenient for the performance of its responsibilities. The Commission is authorized to apply for the privilege of establishing, operating and maintaining foreign-trade zones. The Commission is empowered to construct new canals or improve any existing canal, river or other waterway. The statute provides several means by which the Commission may finance its activities. (Reed-Florida)
W73-09723

WATER SUPPLY.

Ind. Ann. Stat. secs. 35-2921 thru 35-2931 (Supp 1972).

Descriptors: *Treatment facilities, *Indiana, *Legislation, *Water supply, Water pollution control, Water yield, Environmental sanitation, Water conservation, Water distribution (Applied), Water management (Applied), Water policy, Water supply development, Water utilization, Water works, Water treatment, Waste water treatment, Permits, Regulation, Administrative agencies, State governments.
Identifiers: *Licenses.

It shall be unlawful for any person, firm or corporation, both municipal and private, to operate a water or wastewater treatment plant, or a water distribution system unless the operator in charge is duly certified, and it is also unlawful for any person to perform the duties of such an operator without being so certified. The State Board of Health is authorized to adopt rules and regulations with regard to the basis for classification of water and water treatment systems, provisions establishing qualifications for operator applicants and procedures for examination of candidates, and such other provisions necessary to enforce this chapter. The State Health Commissioner is to issue certificates attesting to the competency of operators; provisions relating to application, fees, notice of revocation and expiration are also set forth. (Dunham-Florida)
W73-09724

INDIANA DRAINAGE CODE--DRAINAGE BOARDS--POWERS AND DUTIES.

Ind Ann Stat secs, 27-2004 thru 27-2016 (Supp. 1972).

Descriptors: *Indiana, *Legislation, *Drainage programs, *Land management, *Drainage districts, Water management (Applied), Drainage, Drainage area, Drainage systems, Multiple purpose projects, Soil conservation, State governments, Local governments, Administrative agencies, Water control, Flood control, Drainage engineering, Project planning, Controlled drainage, Governmental interrelations.

The county commissioners or a board expressly appointed by them shall constitute the County Drainage Board, (Board). The Board is authorized to employ an attorney to represent and advise it. The Board is required to employ either the county

surveyor or a qualified deputy to investigate and formulate necessary construction or reconstruction of drainage facilities. When it appears that projected programs may affect lands in more than one county, a joint meeting of affected drainage boards is required. The membership and administration of such a joint board meeting is provided with a possibility of waiver by the affected county's Board under certain circumstances. Board members having an interest in any construction, reconstruction or maintenance of drains by reason of ownership of lands affected by such drains must disqualify themselves in that proceeding. (Dunham-Florida)
W73-09725

WATER RIGHTS.
Ind Ann Stat secs, 27-1401 thru 27-1409, (1970).

Descriptors: *Indiana, *Legislation, *Riparian rights, *Water rights, *Water allocation (Policy), Legal aspects, Water law, Administrative agencies, Competing uses, Irrigation, Regulation, Water contracts, Water utilization, Water resources development, Water policy, Comprehensive planning, State governments, Water management (Applied), Water conservation, Consumptive use, Non-consumptive use, Public health, Surface waters, Diversion.

In promoting and expanding the beneficial uses of surface water resources in the interest of the general welfare of the people of the state, the surface waters of the state are declared to be public waters and subject to regulation by the Indiana general assembly. Users of such waters who institute withdrawal of water for artificial uses or who increase such uses shall be subject to any regulations enacted by the legislature. Riparian owners' rights, insofar as use of public water for domestic purposes and/or impounding such waters for irrigation, are set forth. The Indiana Flood Control and Water Resources Commission, (Commission), is authorized to mediate disputes arising between the users of surface waters. Such mediation is not binding and does not preclude redress to the courts. The Commission is also empowered to contract to dispose and sell water stored in state financed projects with the governor's approval. Proceeds from such contracts will go into the Water Resources Development Fund, and will be used by the state to further water resources development. (Dunham-Florida)
W73-09726

DRAINAGE MAINTENANCE AND REPAIR DISTRICTS; MISCELLANEOUS PROVISIONS.
Ind Ann Stat secs, 27-247, 27-248, 27-411 thru 27-420 (Supp. 1972).

Descriptors: *Indiana, *Legislation, *Drainage programs, *Drainage districts, *Assessments, Drainage engineering, Controlled drainage, Drainage systems, Water policy, Land use, Soil conservation, Flood control, Multiple purpose projects, Water management (Applied), Water control, Taxes, Artificial watercourses, Ditches, Channels, Penalties (Legal).

The Commissioners of Drainage Maintenance and Repair Districts appointed by the court shall keep and maintain dredge ditches and drains in proper condition and shall have full power and authority to do all acts necessary and incident thereto. The procedure for levying assessments to raise drainage maintenance funds is set forth, and no obligations by the commissioners may be made until the assessments are levied. The commissioners are required to keep a complete record of expenses incurred and must file itemized statements with the county auditor. Regulations regarding compensation for and appointment of commissioners are provided. Provisions are also included for the construction of channels by private persons. No such channel may be constructed without the written approval of the Commission. (Dunham-Florida)
W73-09727

CANAL AUTHORITY V. MILLER (CHALLENGE TO COURT'S GRANTING A PERPETUAL EASEMENT RATHER THAN A FEE SIMPLE IN EMINENT DOMAIN PROCEEDINGS).
230 So 2d 193-196 (1st D.C.A. Fla. 1970).

Descriptors: *Florida, *Canals, *Eminent domain, *Adjacent landowners, Judicial decisions, Public rights, Legal aspects, Boundaries, Adjudication procedure, Administrative agencies, Public benefits, Navigable waters, Legislation, Condemnation, Easements.
Identifiers: *Cross-Florida Barge Canal, *Legislative interpretation.

This eminent domain proceeding resulted in the granting of a perpetual easement over appellee landowner's property through which the appellant canal authority, as a delegate of the state, planned construction of the Cross-Florida Barge Canal. Chapters 73, 74 and 374 of the Florida Statutes vested appellant with the power of eminent domain. Appellant was denied the order of taking for a fee simple title to such properties. The appeals court affirmed holding that an acquiring authority will not be permitted to take a greater quantity of property, or a greater interest or estate therein, than is necessary to serve the particular public use for which the property is being acquired. Evidence presented at the hearing was deemed adequate that the Canal Authority be vested with a perpetual easement to control water and land usage; it was not necessary that fee simple title be granted to the authority by the sovereign power of eminent domain. (Smith-Adam-Florida)
W73-09728

THIESEN V. GULF, F. AND A. RY. CO. (EXTENT OF LAND OWNERSHIP OF RIPARIAN INTERESTS ALONG NAVIGABLE WATERS).

78 So 491-507 (Fla. 1917).

Descriptors: *Florida, *Navigable waters, *Reparian rights, *Judicial decisions, Compensation, Condemnation, Landfills, Legal aspects, Banks, Legislation, Adjacent landowners, Eminent domain, Legal review, Common law, Navigable waters, Public rights, Docks, High water mark, Low water mark, Watercourses (Legal aspects), Penalties (Legal), Boundaries (Property).
Identifiers: Fill permits, Public trust.

Plaintiff landowner attempted to recover damages when defendant railroad company, in accordance with powers granted it by the state, filled in areas from the shoreline towards the channel opposite plaintiff's land. Plaintiff relied upon Florida Statutes purporting to vest title to such submerged lands in riparian owners. The trial court directed a verdict for defendant, holding that plaintiff had not adequately proven that his land was bounded by the low water mark of the bay. After originally affirming the directed verdict, upon rehearing the Florida Supreme Court reversed holding that since there was room for difference of opinion as to whether the boundaries extended to the high water mark of the bay, and since plaintiff had exercised rights of ingress and egress over the bay for a sufficient time, that plaintiff landowner had common law rights as riparian owners. These rights at common law could not be taken away without just compensation. Though some courts had deemed riparian rights subordinate to public rights, the railroad company had utilized the water front only incidentally for public purposes; thus the plaintiff's claim for damages was a proper one for adjudication. (Smith-Adam-Florida)
W73-09729

SPRIGGS V. LEVITT AND SONS, INC. (ACTION TO RECOVER DAMAGES SUSTAINED WHEN STREAM OVERFLOWED ITS BANKS AND FLOODED PLAINTIFF'S HOME).

298 A.2d 442 (Ct. App Md. 1973).

Descriptors: *Maryland, *Judicial decisions, *Highways, *Legal aspects, *Flood damage, Floods, Constitutial law, Regulation, Water law, Local governments, Permits, Culverts, Surface drainage, Flood protection, Flood control, Damages, Water management (Applied), Streams, Stream improvement, Legal review, Project planning.
Identifiers: *Sovereign immunity, Nuisance (Legal aspects), Liability.

This case involved an action brought by plaintiff homeowners against defendants land developer, State Road Commission, the city sanitary commission, and the board of county commissioners to recover for damage sustained when a stream overflowed its banks and flooded their homes after a heavy rain. The plaintiffs contended that the State Roads Commission had created a public nuisance by constructing a culvert of inadequate size or by not properly maintaining the culvert and that the county was liable on the basis of its issuance of a permit to the land developer. The appeals court affirmed the trial court in holding that the State Roads Commission was immune from suit and that the county was immune from suit based upon its issuance of construction permits. Moreover, the court emphasized that the rule that failure to abate a public nuisance having relation to public rights-of-way or other property owned or maintained by a municipality constitutes an actionable wrong is applicable only to municipal corporations and is inapplicable to the State Highway Administration, which is not a municipal corporation under the state constitution. (Mockler-Florida)
W73-09730

INTERNATIONAL PAPER COMPANY OF MOSS POINT V. MISSISSIPPI STATE HIGHWAY DEPARTMENT (OWNERSHIP OF TIDELANDS).

271 So. 2d 395 (Miss. 1972).

Descriptors: *Tidal marshes, *Intertidal areas, *Mississippi, *Ownership of beds, *Accretion (Legal aspects), Beds, Wetlands, Beds under water, Navigable waters, Judicial decisions, Eminent domain, Legislation, Common law, Water law, Water rights, Water policy, Tidal waters, High water mark, Low water mark.
Identifiers: *Public trust doctrine.

Complainant sought an injunction preventing the state from entering upon lands located on an island unless it first secured a right-of-way in conformity with the applicable statutes on eminent domain, and also sought to conceal the state's claim of title thereto. The land in dispute was marshland on a navigable river which had accreted and become less marshy. The trial court sustained the state's demurrer to the complaint and the Supreme Court affirmed. It held that when Mississippi became a state, it became vested as trustee with title to all land under tidewaters, including the spaces between the high and low water marks. The bed of navigable waters was said to be property belonging to the state, and all bodies of land arising from or upon such state owned bay floor become property of the state. The court also noted that since this accreted land was held in trust for the use and benefit of all the people of the state, it was not subject to conveyance to private individuals for private purposes. (Glickman-Florida)
W73-09731

UNITED STATES V. SKIL CORPORATION (CRIMINAL ACTION AGAINST CORPORA-

TION FOR WATER POLLUTION).

351 F. Supp 295-299 (N.D. 111, 1972).

Descriptors: *Judicial decisions, *Oil spills, *Penalties (Legal), *Water pollution sources, *Federal government, Water pollution, Oil pollution, Legal aspects, Navigable streams, Rivers and Harbors Act, Water quality control, Legislation, Legal review, Water pollution control, Federal Water Pollution Control Act, Water resources, Water law, Water policy, Federal jurisdiction.
Identifiers: *Criminal lisbility, *Corporate liability, Corporations.

In a criminal action case of water pollution brought by plaintiff, the United States, against a corporate defendant, there was a fuel oil overflow at defendant's plant which caused oil to flow into a sanitary-storm sewer adjacent to the plant and from there escape into a river. On defendant's motion to suppress evidence, the court held that Congress, in enacting the Rivers and Harbors Appropriation Act section providing that any person in charge of a vessel or facility give notification of any oil discharge and that the notification received or information obtained by exploitation of notification not be used against any such person in a criminal case, did not intend by the phrase 'person in charge' to mean anyone else but the person who was at the facility and in charge under management provisions. It did not intend such phrase to carry with it concepts of corporate action or immunity through an officer or other supervisory personnel. After finding that the person in charge did not provide notification, the court denied the defendant corporation's motion to suppress the evidence, thus adhering to the stated legislative intent of the act. (Mockler-Florida)
W73-09732

ALKIRE V. CASHMAN (CONSTITUTIONAL CHALLENGE TO STATE STATUTE REQUIRING FLUORIDATION OF MUNICIPAL WATER SUPPLIES).

350 F. Supp 360-366 (S.D. Ohio 1972).

Descriptors: *Ohio, *Judicial decisions, *Constitutional law, *Fluoridation, Legal aspects, Statutes, Water treatment, Public health, Regulation, Federal jurisdiction, State jurisdiction, Legislation, State governments, Legal review, Contracts, Public rights, Standards, Water treatment, Water purification.
Identifiers: Injunctive relief.

In an action brought by plaintiffs, residents of a municipality, challenging the constitutionality of a state statute requiring all public water works systems serving 5,000 or more persons to fluoridate their water, the plaintiffs made application for a temporary restraining order on the ground that the statute contained certain alleged constitutional infirmities, including violations of the plaintiffs' rights of privacy, due process, and equal protection. The defendant city maintained that it had the right under federal and state law and under the doctrine of home rule to fluoridate its water supplies. The court held that an exemption of water systems serving fewer than 5,000 persons did not violate the equal protection clause or the requirement of the state constitution that the laws of a general nature have uniform operations throughout the state. Moreover, the court held that the statute did not infringe upon rights under a preexisting water supply contract in violation of the obligation of contract clause of the United States Constitution. In addition, the court emphasized a state law requiring a certain class of municipalities to fluoridate their public water supply does not violate due process or equal protection because the classification had a substantial relation to the object of the legislation. (Mockler-Florida)
W73-09733

SUBAQUEOUS LANDS.

Del. Code Ann tit 7, secs, 6451 thru 6462 (Supp. 1970).

Descriptors: *Beds, *Beds under water, *Delaware, *Legislation, *Public lands, Ownership of beds, Leases, Permits, Legal aspects, Administrative agencies, Regulation, Easements, State- governments, Administrative decisions, State jurisdiction, Water law, Water policy, Legal review, Governments, Water utilization, Water management (Applied).
Identifiers: Licenses, Public hearings.

Except as otherwise provided, the Commission and the Governor shall have exclusive jurisdiction to lease or grant permits or easements in or over subaqueous lands of the state and no use of such lands shall be undertaken except pursuant to a permit or grant. Each applicant for a lease, permit or grant under these provisions must file a detailed request with the Commission. A public hearing on such application shall be held: (1) if use of subaqueous lands is sought for a period of over 10 years; (2) if the Commission determines a hearing to be in the public interest; or (3) if written objection to the application is filed. The Commission may appoint a board to investigate any application. Provisions for the membership and administration of such a board are included. The Commission is to report its recommendation to the Governor who, at his discretion, may execute or refuse any lease, permit, deed or grant. (Dunham-Florida)
W73-09734

MINERALS AND DEPOSITS ON STATE LANDS--SALE OR LEASE.

Ark Stat Ann secs, 10-1001 thru 10-1013 (Supp. 1971).

Descriptors: *Arkansas, *Legislation, *Beds under water, *Mining, Ownership of beds, Leases, Permits, Administrative agencies, Lakes, Navigable waters, Mineralogy, State governments, Regulation, State jurisdiction, Water law, Public lands, Legal aspects, Lake beds, River beds, Oil, Gases, Sands, Gravels, Artificial watercourses.
Identifiers: Recording statutes.

This legislation provides for the regulation of the removal of sand, gravel, oil, coal and other minerals from the navigable rivers and lakes or lands of the state. The Commissioner of Revenues, (Commissioner), is authorized to regulate such activities by the granting of permits and/or leases. Specific details as to the types of permits issuable are provided. The Commissioner is authorized to establish and maintain a permanent record of all leases and agreements for the extraction of such minerals from navigable waters or lands of the state, and anyone receiving a lease is required to record it in the permanent ledger. The state shall not acquire title to oil, gas or minerals in and under artificially created navigable waters created by agencies of the United States or the state where such minerals are not compensated for. The private ownership of minerals in lands covered by artificially created navigable waters are subservient to the public use of such waters. Procedures for record proof of ownership in mineral rights by the owner are set forth. (Dunham-Florida)
W73-09735

GEORGIA WATERWAYS COMMISSION.

17 Ga. Code Ann secs, 301 thru 306, secs 401 thru 403 (Supp 1972).

Descriptors: *Georgia, *Legislation, *Negotiations, *Water resources development, *River basin development, Flood control, Legal aspects, Comprehensive planning, Governments, Planning, Water utilization, Governmental interrelations, State governments, Federal government, Multiple-purpose projects, Watershed management, Land management, Drainage systems, Administrative agencies.

The Georgia Waterways Commission (Commission) is hereby created, consisting of a chairman appointed by the Governor and six appointed members from various river basins of the state. The statutes provide that the commission shall negotiate with the proper authorities of the United States from time to time concerning the development of the rivers of Georgia, and particularly with reference to flood control. Moreover, the Commission shall be privileged to appear before committees of Congress concerning appropriations for river development, to gather and disseminate information, and to cooperate with the federal and state authorities toward the development of Georgia's rivers. However, the Commission shall have no power to make any contract binding upon the State of Georgia or to incur any obligation against the State. Information pertinent to the development of Georgia's rivers as may be obtained by the Commission may be filed from time to time with the Department of Industry and Trade and with the Department of Archives and History. (Mockler-Florida)
W73-09736

NAVIGATION COMPANIES.

17 Ga Code Ann secs, 201 thru 213 (Supp 1972).

Descriptors: *Legislation, *Navigation, *Water policy, *Georgia, *Transportation, Reasonable use, Administration, Legal aspects, Navigable waters, Water law, Harbors, Non-consumptive use, Ships, Public benefits, Water allocation (Policy), State governments, Social needs, Social mobility, Boats.
Identifiers: *Corporations, *Navigation companies.

This chapter provides for the establishment and creation of navigation companies, how they may become incorporated, regulations concerning petition for incorporation, certificates of incorporation, organization of the companies, and the powers of incorporation. The statutes provide that any number of persons, not less than five, who desire to be incorporated for that purpose, may form a company by filing a written petition, addressed to the Secretary of State and stating the names and residences of each of the persons desiring to form said corporation. Other required information includes the name of the navigation company they desire to have incorporated, the amount of the proposed capital stock, the number of years it is to continue and the place where its principal office is to be located. The statutes further provide that said company shall be empowered to acquire, purchase, hold, and operate all such real and personal property as may be necessary or convenient for the maintenance and operation of its said business, to provide services incident to a general navigation business, to erect structures to accommodate freight and passengers, to regulate fees and shipping schedules, and to borrow funds to finance its operations. (Mockler-Florida)
W73-09737

GEORGIA WATER QUALITY CONTROL ACT.

17 Ga Code Ann secs, 501 thru 530 (Supp. 1972).

Descriptors: *Georgia, *Legislation, *Water pollution, *Water quality control, *Water purification, *Water supply development, Legal aspects, Governments, Water resources development, Administrative agencies, Water law, Water policy, Water utilization, Comprehensive planning, Public health, State governments, Water pollution control, ecology, Environmental effects, Administrative decisions.
Identifiers: Administrative regulations.

It is declared to be the policy of the state that its water resources shall be utilized prudently to the maximum benefit of the people in order to restore and maintain a reasonable degree of water purity and to require, where necessary, reasonable treatment of sewage, industrial wastes, and other wastes prior to their discharge into the waters of the state. The act requires that the Water Quality Control Board (Board) be created within the State Department of Public Health and that this agency be charged with the duty and authority to require the use of reasonable methods, after having considered the technical means available, for the reduction of pollution and the economic factors involved to prevent and control pollution. Moreover, the Act provides administrative facilities and procedures within the executive branch and to confer discretionary administrative authority upon the Board to establish procedures designed to best protect the public interest. The powers and duties of the board are listed along with provisions for its administration and budgeting. (Mockler-Florida)
W73-09738

DRAINAGE, SYSTEM OF COUNTY DRAINAGE.

23 Ga Code Ann secs, 2501 thru 2573 (Supp. 1972).

Descriptors: *Georgia, *Drainage systems, *Legislation, *Water management (Applied), Legal aspects, Water quality control, Administration, Easements, Canals, Dams, Economics, Remedies, Water control, Drainage programs, Water utilization, Flood control, Water conservation, Land use, Project planning, Administrative agencies, Administrative decisions, Legal review, Financing, Bond issues, State governments, Local governments.
Identifiers: Administrative regulations.

In an attempt to fulfill the state's policy of draining and reclaiming wet, swamp, or overflowed lands for the public benefit, these provisions authorize each county to establish and maintain a system of lowland drainage and acquire the right-of-way and other easements necessary for the construction of structures incident to such a system. The right-of-way may be acquired from the landowners, with their consent, for the consideration of benefits conferred upon them by the drainage established. Procedures are established to initiate drainage districts, maintain established districts, and provide for their administration and budgeting. There is provided a framework for hearings and appeals for those landowners affected by the creation, administration or project planning of a drainage district. Provisions relating to financing through tax assessments and bonds with remedies for bond holders are also included. (Mockler-Florida)
W73-09739

CONDEMNATION BY COUNTIES FOR WATERSHEDS.

36 Ga Code Ann secs, 401 thru 1405 (Supp 1972).

Descriptors: *Georgia, *Eminent domain, *Condemnation, *Watershed management, *Legislation, Flood prevention, Easements, Legal aspects, Public access, Right-of-way, Access routes, Flood protection, Flood control, Local governments, Recreation facilities.

Every county of the State of Georgia is granted the power of eminent domain for the purpose of taking by condemnation necessary easements and property rights to enable the county to complete small watershed projects and improve watershed protection and flood control. The right of eminent domain may also be used to acquire lands for certain public recreation facilities to be developed in connection with watershed projects. The power of eminent domain includes the right to condemn land to allow for rights of ingress and egress from any such project. The procedures to be followed for such takings are those set forth by the pertinent eminent domain statutes of the state. The condemnor shall be required to condemn the fee simple title to any land which will be covered by permanent flooding. (Glickman-Florida)
W73-09740

WATER RIGHTS, NAVIGABLE STREAMS, ETC.

85 Ga. Code Ann. secs. 1301 thru 1312 (Supp. 1972).

Descriptors: *Georgia, *Beds, *Legislation, *Streams, Beds under water, Ownership of beds, Streambeds, Low water mark, Navigable waters, Tidal waters, Tidal streams, Water law, Dams, Embankments, Bridges, Legal aspects, State governments, Boundaries (Property), Riparian rights, Adjacent landowners, Shores, Accretion (Legal aspects), Boundary disputes, Water rights.
Identifiers: *Non-navigable streams.

Running water belongs to the owner of the land it is on, but he has no right to divert it or interfere with the enjoyment of it by the next owner. The beds of nonnavigable streams belong to the owner of the adjacent land, with the center of the main current the dividing line between two landowners. Accretions of land on either side belong to the owner. The rights of the owner of lands adjacent to navigable streams extend to the low water mark of the streambed. The owner of a nonnavigable stream is entitled to exclusive possession thereof. Owners of land on both sides of nonnavigable streams may construct dams across them. The title to beds of all tide waters shall belong to the owner of the adjacent land. The rights of the owners shall extend to the low water mark in the bed. Owners of lands on any watercourses are authorized to ditch and embank their land to protect it from overflows of the watercourse. The right to construct a private bridge is appurtenant to the land, but the right to establish a public bridge is a franchise of the state. (Glickman-Florida)
W73-09741

DRAINAGE OF LANDS ADJACENT PUBLIC ROADS,

Del. Code Ann. tit. 17, sec. 901 (Supp. 1970).

Descriptors: *Delaware, *Surface drainage, *Drainage, *Controlled drainage, Drainage programs, Administration, Legal aspects, Legislation, Water law, Water policy, Drainage engineering, Contours, Ditches, Drainage area, Highway effects, Alteration of flow, Surface runoff.

The Department of Highways and Transportation shall cause to be drained by sufficient ditches or conduits, waters which have backed upon lands along the right of way of any road or highway caused by changing the natural contour lines and levels, along and over the area confined within such right of way, whereby the natural flow and drainage from such lands is hindered or stopped. (Glickman-Florida)
W73-09742

FLOOD LOSS PREVENTION.
Ark. Stat. Ann. secs. 21-1901 thru 21-1904 (Supp. 1971).

Descriptors: *Flood plain zoning, *Land management, *Arkansas, *Legislation, *Flood control, Regulation, Floods, Flood damage, Building codes, Flood protection, Flood plains, Public health, Drainage systems, Floodproofing, Zoning, Land development, Land use, Penalties (Legal), Local governments.
Identifiers: Nuisance (Legal aspects), Injunctive relief.

Since many areas of the state are threatened by floods, it is necessary to adopt state and local regulations which will prevent and lessen such flood hazards and losses. Any city or county in the state is authorized to enact ordinances or other appropriate measures regulating the development of land in flood-prone areas. Such ordinances should regulate the type, purposes and uses of structures, buildings and developments permitted to be erected in flood-prone areas, as well as require drainage to minimize flooding. If the Soil and Water Conservation Commission finds that any city or county has not adopted reasonable and effective measures, the Commission may prescribe regulations. Anything placed in a flood prone area in violation of this act is a public nuisance, and subject to injunction. (Glickman-Florida)
W73-09743

WHITE RIVER NAVIGATION DISTRICT COMMISSION.

Ark. Stat. Ann. secs. 21-1601, 21-1606 (Supp. 1971).

Descriptors: *Arkansas, *Navigation, *Transportation, *Legislation, Rivers, River systems, Tributaries, Administrative agencies, Easements, Right-of-way, United States, Water law, Water policy, Legal aspects, Damages.

The White River Navigation District Commission shall have full power to cooperate with other agencies for the improvement of the White River and its tributaries, to provide the necessary lands, easements and rights-of-way in connection therewith, and to hold the United States free from damages resulting from the construction of any improvements on the river. The Commission shall have the power to do all acts and transact all business necessary in connection with any navigation, construction or improvement project on the White River by any agency of the state or federal government. (Glickman-Florida)
W73-09744

IRRIGATION, DRAINAGE AND WATERSHED IMPROVEMENT DISTRICT ACT OF 1949.
Ark. Stat. Ann. secs. 21-901 thru 21-931 (Supp. 1971).

Descriptors: *Arkansas, *Watershed management, *Watershed Protect. and Flood Prev. Act, *Project planning, *Levee districts, Flood prevention, Legislation, Regulation, Administrative agencies, Water policy, Water law, Financing, Bond issues, Budgeting, Costs, Loans, Governmental interrelations.

Plans prepared by local organizations as defined by the Watershed Protection and Flood Prevention Act, or by appropriate state or federal agencies may be adopted by the Board of Directors of the levee district, and when so adopted shall become the plan of watershed improvement of such district. This plan shall be filed with the circuit clerk and accompanied by a map showing the location of the proposed improvements. The final work plan for these improvements may be divided into one or more units of construction. The Board shall have authority to let contracts for carrying out the works of improvement, as well as borrow money and issue notes or bonds and assess benefits and damages on a construction area basis. (Glickman-Florida)
W73-09745

DELAWARE RIVER BASIN COMPACT.
Del. Code Ann. tit. 7, secs. 6501 thru 5613 (Supp. 1970).

Descriptors: *River basin commissions, *Interstate compacts, *Delaware River Basin Commission, *Water management (Applied),

*Delaware, Governmental interrelations, Water resources development, Delaware River, Interstate rivers, Comprehensive planning, Public health, Legislation, Regional development, Water conservation, Water policy, Water supply, Water pollution control, Recreation, Water utilization, River basin development, Interstate commissions, Jurisdiction, Water allocation (Policy), Flood control, Water shed management.
Identifiers: *Delaware River Basin Compact.

Pursuant to negotiations among the four Delaware River Basin states, (Delaware, New Jersey, New York and Pennsylvania), and the United States, this state adopts the Delaware River Basin Compact (Compact), a federal-interstate compact for the creation of a basin agency whose purpose is the conservation, utilization, development, management and control of the water and related resources of the Delaware River Basin under a comprehensive multipurpose plan to bring the greatest benefits and produce the most efficient service in the public welfare. The Compact authorizes the creation of the Delaware River Basin Commission, (Commission), as a body politic and corporate. The powers and duties of the Commission are specified with provisions relating to water supply, pollution control, flood protection, recreation, hydroelectric power, regulation of withdrawals and diversions, intergovernmental relations, capital financing for plans and programs and budgeting. Auxilliary powers of the Commission and functions of the Commissioners are also listed. (Dunham-Florida)
W73-09746

WATERSHED CONSERVANCY DISTRICT.

Ala. Code tit. 2, secs 670 (1) thru 670 (9) (Supp. 1971).

Descriptors: *Alabama, *Legislation, *Watershed management, *Water management (Applied), Control, Erosion control, Flood control, Land management, Habitat improvement, Soil management, Water conservation, Water supply, Water utilization, Water yield, Water yield improvement, Water zoning, Watersheds (Basins), Sediment yield, Floods, Drainage, Land use, Multiple purpose projects, Administrative agencies, Water districts.

Subdistricts of a soil conservation district within this state may be formed in any watershed area for the purpose of developing and executing plans and programs relating to any phase of water conservation, water usage, flood prevention, flood control, erosion prevention and control, and floodwater and sediment damages. These subdistricts shall be known as watershed conservancy districts. All owners of land within the district are eligible to elect a board of directors for such districts. Provisions are included for the qualifications and elections of board members. Such board of directors shall be the governing body of the watershed conservancy district. (Dunham-Florida)
W73-09747

ALABAMA WATERSHED MANAGEMENT ACT.
Ala. Code tit. 2, secs. 273 (1) thru 273 (58) (Supp. 1971).

Descriptors: *Alabama, *Legislation, *Water conservation, *Water management (Applied), *Water districts, Flood control, Land management, Water supply, Water utilization, Water yield, Water yield improvement, Water zoning, Floods, Drainage, Land use, Project-purposes, Multiple-purpose projects, Administrative agencies, Legal aspects, Legal review, Water policy, Environmental effects, Public health.

To implement state policy of establishing programs for the improvement of drainage of wetlands, flood control, and water conservation, the court of probate of any county within the state is given jurisdiction and authority to establish water management districts upon entertaining a petition by a specified number of landowners within the proposed district. Upon the organization of a district the court is authorized to appoint a board of water management commissioners with replacement also by appointment. The commissioners are authorized to appoint a district engineer to aid them in their work. Specific provisions relating to the powers and duties of the commissioners acting with the county probate court are set forth including such areas as: eminent domain, levying taxes and issuing bonds to finance district programs, contractual authority, and annexing land to the district. Also included are provisions for notice-giving, public hearings, and appeal for persons affected by decisions or programs of the commissioners. (Dunham-Florida)
W73-09748

6G. Ecologic Impact of Water Development

FORESTS, WETLANDS AND WATERFOWL POPULATIONS IN THE TURTLE MOUNTAINS OF NORTH DAKOTA AND MANITOBA,
North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 02I.
W73-09136

ECOLOGY. THE EXPERIMENTAL ANALYSIS OF DISTRIBUTION AND ABUNDANCE,
C. J. Krebs.
Harper and Row, Publishers: New York, N.Y., London, Engl, 1972. 694 p. Illus. Maps, Pr. $14.95.
Identifiers: Abundance, *Animals, Books, Distribution, *Ecology, *Mathematical models, *Plants, Water pollution control.

Special interest is planned on problems in ecology and substantiating these problems with examples from diverse representatives from the plant and animal kingdoms. The first section, what is ecology, contains a brief introduction to the science of ecology and its basic problems and approach to these problems. Section 2, the problem of distribution in populations, discusses the following limitations on distribution: dispersal, behavior, interrelations with other organisms, temperature, moisture, other chemical and physical factors; and adaptation complications. Section 3, the problem of abundance in populations, describes the following aspects: population parameters; demographic techniques; population growth; species interactions, including competition and predation; natural regulation of population size; examples of population studies; applied problems, including optimum yield and biological control. Part 4, distribution and abundance at the community level, covers the following topics: community parameters; the nature of the community; community change; community metabolism, both primary and secondary production; species diversity; community organization; and evolutionary ecology. The final section, human ecology, discussed a variety of aspects of human population and food production. Two appendixes (estimation of the size of the marked population in capture-recapture studies, and instantaneous and finit rates), a glossary, a list of mathematical symbols, an extensive bibliography and a species index are included.–Copyright 1972, Biological Abstracts, Inc.
W73-09547

ENVIRONMENTAL AND ECONOMIC IMPACT OF RAPID GROWTH ON A RURAL AREA: PALM COAST,
Southeastern Environmental Services, Jacksonville, Fla.
For primary bibliographic entry see Field 05G.
W73-09656

THE UNITED NATIONS AND THE ENVIRONMENT,
Conference on the Human Environment, New York.
M. F. Strong.
World Eco-Crisis is available, as W-105, from University of Wisconsin Press, Madison, for $2.50. In: World Eco-Crisis: International Organization in Response. University of Wisconsin Press, Madison, Wisconsin. p 3-6. June 1972.

Descriptors: *United Nations, *Environmental control, *Planning, *Documentation.

The complex nature of environmental problems is explained. The concept of 'human environment' is developed to encompass natural and man-made pollution, use and misuse of natural resources, population, food production, etc. The unity of the natural environment creates a chain of cause and effect relationships which link local and global concerns. The role of the U.N. in gathering information and implementing action is discussed. (See W73-09659 thru W73-09664) (Ensign-PAI)
W73-09658

THE ROLE OF THE UN IN ENVIRONMENTAL PROBLEMS,
Columbia Univ., New York.
R. N. Gardner.
In: World Eco-Crisis: International Organizations in Response. University of Wisconsin Press, Madison, Wisconsin. p 69-86, June 1972.

Descriptors: *United Nations, *Environmental control, *Pollution abatement, *Planning.
Identifiers: *Stockholm conference.

The state of the world environment and particularly the problems of air and water pollution are topics of concern for the United Nations. The UN is the only framework available for unilateral cooperation among nations. Although pollution problems have been created largely by the technologically 'advanced' countries of the world, the current and future actions of less developed states can have serious effects on the global environment. The UN's efforts to plan a conference on the Human Environment in Stockholm are reviewed. The basic organizational principle underlying the Conference, as well as the range of organizational choices, are discussed in some detail. The success of the Stockholm conference is contingent upon the ability of the participating nations to devise a workable pattern of international cooperation for dealing with environmental problems. (See also W73-09658) (Ensign-PAI)
W73-09659

ADDING THE TIME DIMENSION TO ENVIRONMENTAL POLICY,
Alfred P. Sloan School of Management, Cambridge, Mass.
D. L. Meadows, and J. Randers.
In: World Eco-Crisis: International Organization in Response. University of Wisconsin Press, Madison, Wisconsin. p 47-66, June 5, 1972. 5 fig, 1 tab.

Descriptors: *DDT, *Solid wastes, *Systems analysis, *Environmental effects, *Planning, Economics, Projections, Decision making.
Identifiers: Policy considerations, Time factors.

Problems of environmental deterioration are by their nature longterm and not always clearly apparent. As such, they do not force immediate corrective action. Data gathered on two studies, one concerning DDT in the environment, the other on solid waste are presented in some detail. Systems-analysis was used to bring together existing information about DDT and solid waste flows and then to assess the dynamic implications of that information in order to instigate and/or influence long-term policy considerations. In each of the two pollutant studies discussed, the negative factor of

time delays is repeatedly mentioned. The environmental costs of pollution in each case extend for a much longer time period than do the benefits derived from the polluting activity. However, once a pollution limiting policy has been established it may take as many as 10 years before its first benefits become obvious. Any new policies must be based on an active commitment to the future. (See also W73-09658) (Ensign-PAI)
W73-09660

THE UNITED NATION'S INSTITUTIONAL RESPONSE TO STOCKHOLM: A CASE STUDY IN THE INTERNATIONAL POLITICS OF INSTITUTIONAL CHANGE,
Sussex Univ., Brighton (England). Inst. for the Study of International Organization.
B. Johnson.
In: World Eco-Crisis: International Organization in Response. University of Wisconsin Press, Madison, Wisconsin. p 87-134, June 1972. 2 append.

Descriptors: *United Nations, *Environmental control, *Monitoring, *Governments, *Decision making.
Identifiers: National enforcement, Public opinion.

Attention is focussed on the implications of international response to environmental problems. An attempt is made to clarify the present distribution of environmental responsibilities among the major international organizations. Certain principles and possible approaches to the problem of organizing the world's environmental monitoring and protection activities are discussed. Attitudes of various governments, scientific bodies, and the general public are explored. George Kennan's proposal for a world ecological agency is reviewed in light of power distributions, the role of emerging countries, etc. Practical institutional alternatives are proposed; the optimum design developed remits execution of international policy primarily to national governments. At the international level, institutions and policies should be flexible, pragmatic, and cautious. (See also W73-09658) (Ensign-PAI)
W73-09661

THE ROLE OF SPECIAL PURPOSE AND NONGOVERNMENTAL ORGANIZATIONS IN THE ENVIRONMENTAL CRISIS,
International Council of Scientific Unions, Rome, (Italy). Special Committee on Problems of the Environment.
J. E. Smith.
In: World Eco-Crisis: International Organizations in Response. University of Wisconsin Press, Madison, Wisconsin. p 135-159, June 1972. 1 tab.

Descriptors: *Environmental control, *International commissions, *Inter-agency cooperation, *Water quality, *Planning, Natural resources.

Special purpose and nongovernmental organizations can serve important functions in the area of environmental improvement. This study provides information on such groups as the International Council of Scientific Unions (ICSU), the World Health Organization (WHO), the Food and Agriculture Organization (FAO), and the World Meteorological Organization (WMO). These bodies serve to promote international collaborative inquiry into the state of the environment; investigate the quality and quantity of man-made environmental changes; and note the effects of such changes on man and living ecosystems. Some of the specific projects undertaken in areas such as water quality and biological investigations are discussed. Attention is given to ways in which the present institutional arrangements might be better utilized and areas in which new processes are necessary for better coordination, communication, and implementation of research. (See also W73-09658) (Ensign-PAI)
W73-09662

THE ROLE OF THE WMO IN ENVIRONMENTAL ISSUES,
World Meteorological Organization, Geneva (Switzerland).
D. A. Davies.
In: World Eco-Crisis: International Organizations in Response. University of Wisconsin Press, Madison, Wisconsin. p 161-170, June 1972.

Descriptors: *Environmental control, *Monitoring, *Air pollution, *Water pollution, Path of pollutants, Sampling, *Inter-agency cooperation, Pollution abatement.
Identifiers: *World Meteorological Organization, Pollution control.

The role of the World Meteorological Organization (WMO) in identifying and alleviating world pollution problems is reviewed. Areas such as monitoring the atmosphere, research on climatic changes, studies of pollutant transport and water resource development are examined. Atmospheric monitoring, for example, is carried on by the WMO's World Weather Watch which surveys the atmosphere on a daily basis and supplies all the countries of the world with necessary meteorological data. The organization and routine processes of the World Weather Watch are described. The importance of cooperation between the WMO and other agencies is acknowledged. (See also W73-09658) (Ensign-PAI)
W73-09663

INTERNATIONAL INSTITUTIONS FOR ENVIRONMENTAL MANAGEMENT,
Council on Environmental Quality, Washington, D.C.
G. J. MacDonald.
In: World Eco-Crisis: International Organizations in Response. University of Wisconsin Press, Madison, Wisconsin. p 207-235, June 1972. 2 tab.

Descriptors: *Environmental control, *Governments, Pollutants, *Pollution abatement, *Economics, *Legislation, *Management.
Identifiers: Worldwide institutions, National control.

Various environmental problems facing the nations of the world are outlined. Pollutants are ordered by references to their lifetime or resident time in air, water, or land, where they are introduced, and what their potential effects are. In this way it can be better established which problems are best treated by bilateral, regional, or worldwide institutions. The economic consequences of environmental measures are also studied. Since the additional cost of production due to pollution control measures is or will be reflected in higher prices which will in turn effect world trade, international mechanisms must be developed for reaching fair agreements. The use and misuse of natural resources, including the land itself, is also considered. The report concludes that environmental problems are many-faceted and are usually best dealt with at a national, rather than international level. Furthermore, the lack of tradition and capabilities of enforcement by international organizations support the argument for national measures. (See also W73-09658) (Ensign-PAI)
W73-09664

SHORTCUT PIPELINE MODIFICATION CONTRA COSTA CANAL UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-09696

WAHKIAKUM COUNTY CONSOLIDATED DIKING DISTRICT NO. 1, WAHKIAKUM COUNTY, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W73-09697

PROSPERITY LAKE, SPRING RIVER AND TRIBUTARIES, MISSOURI-KANSAS-OKLAHOMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W73-09698

CORNUDAS, NORTH AND CULP DRAWS WATERSHED, HUDSPETH COUNTY, TEXAS AND OTERO COUNTY, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-09699

LOCAL PROTECTION PROJECT, LOG JAM REMOVAL ON SALAMONIE RIVER NEAR BLUFFTON IN WELLS COUNTY, INDIANA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W73-09700

ENVIRONMENTAL PROTECTION ACT OF 1971.
For primary bibliographic entry see Field 06E.
W73-09711

07. RESOURCES DATA

7A. Network Design

RECOMMENDED METHODS FOR WATER DATA ACQUISITION.

Preliminary Report of the Federal Interagency Work Group on Designation of Standards for Water Data Acquisition: Geological Survey, Office of Water Data Coordination, December 1972. 415 p.

Descriptors: *Water resources, *Data collections, *Methodology, *Testing procedures, *Water sampling, Surface waters, Groundwater, Fluvial sediments, Water quality, Biological properties, Inorganic compounds, Physicochemical properties, Monitoring, Automation.
Identifiers: *Water data acquisition methods.

This report documents results of interagency efforts during 1970-72 to designate recommended methods for acquisition of water data. Methods specified were identified as the most acceptable of those currently in use. The methods represent the findings of six task groups established by the Federal Interagency Work Group on Designation of Standards for Water Data Acquisition. This Work Group was established under the auspices of the Geological Survey's Office of Water Data Coordination. The task groups consisted of more than 60 technical experts in the field of water data from six departments and two independent agencies of the federal government. Task groups covered the following areas of concern: (1) surface-water stage and quantity; (2) chemical (inorganic) and physical quality; (3) biologic, bacteriologic, and chemical (organic) quality; (4) sediment; (5) groundwater; and (6) automatic water-quality monitors. The findings of the task groups are presented as separate chapters. (Woodard-USGS)
W73-09161

HYDROLOGY OF SMOOTH PLAINLANDS OF ARID AUSTRALIA.
Department of National Development, Canberra (Australia).
For primary bibliographic entry see Field 07C.

W73-09276

CLASSIFICATION AND EVALUATION OF FRESHWATER WETLANDS AS WILDLIFE HABITAT IN THE GLACIATED NORTHEAST,
Massachusetts Univ., Amherst. Dept. of Biology.
For primary bibliographic entry see Field 02I.
W73-09430

7B. Data Acquisition

A FIELD INVESTIGATION AND NUMERICAL SIMULATION OF COASTAL FOG,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 02B.
W73-09122

PROCESSING FOR SPACEBORNE SYNTHETIC APERTURE RADAR IMAGERY,
Computer Sciences Corp., Huntsville, Ala.
M. Lybanon.
National Aeronautic and Space Administration Contractor Report 2193, February, 1973. 95 p, 29 fig, 2 tab, 44 ref, 2 append.

Descriptors: *Remote sensing, *Natural resources, *Radar, *Satellites (Artificial), *Data processing, Methodology, Data collections, Equipment, Instrumentation, Computer models, Statistical methods, Numerical analysis, Water resources.
Identifiers: *Synthetic aperture radar imagery.

Synthetic aperture radar (SAR) and the processing required to produce high-resolution imagery are discussed. Particular attention is paid to the use of SAR as a satallite-borne earth resources remote sensor and the associated data handling and processing problems which are different from those associated with airborne radars. A computer simulation of a complete synthetic aperture radar system is described, including examples of its output. The simulator can be useful in preparing for the new applications of SAR. Sections I and II of the report introduce the basic principles and simplified theory. The analysis is sufficient to allow realistic estimation of data rates. Sections III and IV go more deeply into the mathematical theory and details of the processing. Section III is a thorough analysis of the properties of the received radar signal and the mathematical operations required to produce imagery. Section IV discusses both the conventional coherent optical processing technique (appendices A and B cover the physical principles involved) and the possibility of real-time SAR digital processing. A proposed onboard real-time SAT digital processor is described including a number of concepts relevant to the design of this and more sophisticated digital processors. Section V describes a complete SAR digital computer simulation, discusses its use, and gives examples of output. Conclusions are presented in section VI. (Woodard-USGS)
W73-09124

PULSED NEON LASER BATHYMETRIC STUDIES USING SIMULATED DELAWARE BAY WATERS,
Sparcom Inc., Alexandria, Va.
For primary bibliographic entry see Field 02L.
W73-09138

SOME MECHANISMS OF OCEANIC MIXING REVEALED IN AERIAL PHOTOGRAPHS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
G. Assaf, R. Gerard, and A. L. Gordon.
Journal of Geophysical Research, Vol 76, No 27, p 6550-6572, September 20, 1971. 23 fig, 3 tab, 19 ref. NOO N62306-67-C-0296, AEC AT (31-1) 2663.

Descriptors: *Mixing, *Currents (Water), *Oceans, *Aerial photography, *Tracking techniques, Ocean currents, Diffusion, Dispersion, Winds, Waves (Water).
Identifiers: Langmuir cells, Ekman spirals.

Circulation rates within the mixed layer of the ocean were made based on aerial photography of dye injections and floating cards in the surface and near-surface levels under different wind, sea state, and thermal profile conditions. Except under calm conditions, the first few meters of the sea are subjected to helical flow of small-size Langmuir cells with 3 to 6 meter spacing between the convergence lines. Under moderate to strong wind conditions (10-30 knots), a hierarchy of larger-size Langmuir cells is developed. The maximum horizontal spacing between the larger cells is approximately the same as the depth of the mixing layer. The spacing of the convergence zones between the largest cells was 280 meters, and they were accompanied by medium and small-size cells of approximately 35 and 5 meters, respectively. Estimates of the apparent vertical diffusion associated with the large and medium Langmuir cells are thousands and hundreds of sq cm/sec, respectively. A stratified flow resembling an Ekman spiral was observed under moderate conditions. The transition from the Ekman to the Langmuir regime occurs with turbulence Reynolds numbers of approximately 100. Under calm conditions following a period of moderate winds and thermal instability, convergence zones have anticyclonic rotation. (Knapp-USGS)
W73-09168

PRECISION REQUIREMENTS FOR A SPACECRAFT TIDE PROGRAM,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
B. D. Zetler, and G. A. Maul.
Journal of Geophysical Research, Vol 76, No 27, p 6601-6605, September 20, 1971. 3 fig, 2 tab, 10 ref.

Descriptors: *Satellites (Artificial), *Water level fluctuations, *Tides, Data collections, Radar, Statistics.

A tidal analysis of sea-surface elevations from an orbiting altimeter will include errors due to the instrument and the orbital determinations. Furthermore, the results may be somewhat degraded by the small amount of data and their random distribution in time. These effects were evaluated in a numerical feasibility investigation with the use of observed hourly heights at two tide stations and a hypothetical satellite orbit with a 30 deg inclination and a period of about 95 min. For a station at 13 deg N with a water elevation assumed to be obtained each time the altimeter transits a 1 deg square centered at the station, 86 observations are obtained in a year. For a station at 22 deg N, areas of 1 deg to 5 deg square were used, and the number of observations in a year varied from 112 to 551. Degradation of the signal was studied by introducing sequentially increased levels of white noise to the observations. The harmonic constants for the smaller constituents deteriorate rather quickly as white noise is added, but the largest constituents appear to be reasonably determined even when random numbers with extreme absolute values as large as the amplitude are added to the data. The results indicate that previously stated minimum precision requirements for a spacecraft tide program can be relaxed by roughly an order of magnitude. (Knapp-USGS)
W73-09170

MECHANISM OF RESPIRATORY EXCHANGES IN AQUATIC ENVIRONMENT. A GENERAL REVIEW INCLUDING PERSONAL RESULTS,
Amiens Univ. (France). Laboratoire de Physiologie.
For primary bibliographic entry see Field 05C.
W73-09206

REMOTE SENSING AS AN AID TO THE MANAGEMENT OF EARTH RESOURCES,
California Univ., Berkeley. Space Sciences Lab.
R. N. Colwell.
American Scientist, Vol 61, No 2, March-April, 1973, p 175-183, 9 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Resources, *Radar, Infrared radiation, Electromagnetic waves, Satellites (Artificial), California, Vegetation, *Photography, Agriculture, Management.
Identifiers: *Renewable resources, Nonrenewable resources, *Imagery analysis, Spacecraft, Inventory (Resources).

In the field of remote sensing--acquiring information through the use of cameras and related devices, such as radar and thermal infrared sensors, operated from aircraft and spacecraft--several useful developments have taken place which aid in the acquisition of better and more timely resource information and hence in better resource management. Remote sensing is expected to be of greatest use to mankind in the monitoring of renewable resources, allowing, for example, agriculturists to predict each year the best time to mobilize the labor force, equipment, and food-processing facilities that will be needed for the harvest and to determine how much of each component will be needed. Multiband, multidate, and multistage photographs and their uses are explained, along with a series of color plates illustrating the various types of photographs and their interpretation. Thermal infrared and radar imagery techniques are also outlined. It is shown that a considerable savings in sampling and surveying costs may be realized by the use of remote sensing methods, by greatly reducing the number of on-the-ground observations. (Campbell-NWWA)
W73-09262

INSTRUMENTATION FOR ENVIRONMENTAL MONITORING: WATER.
California Univ., Berkeley. Lawrence Berkeley Lab.

Lawrence Berkeley Laboratory LBL-1, Vol 2, February 1, 1973. 236 p. NSF AG-271.

Descriptors: *Water quality, *Chemical analysis, *Monitoring, *Instrumentation, Analytical techniques, Water pollution sources, Water quality control, Remote sensing, Research equipment, Research and development, Path of pollutants.

A survey of instrumentation for environmental monitoring is being carried out by the Lawrence Berkeley Laboratory, University of California, under a grant from the National Science Foundation. Instruments being investigated are those useful for measurements in air quality, water quality, radiation, and biomedicine related to environmental research and monitoring. Consideration is given to instruments and techniques presently in use and to those developed for other purposes but having possible applications to this work. The results are given as descriptions of the physical and operating characteristics of available instruments, critical comparisons among instrumentation methods, and recommendations of promising methodology and development of new instrumentation. The survey material will be compiled in four looseleaf volumes which can be periodically updated. This is volume 2. Emphasis in this volume is on monitoring instruments suitable for freshwater and estuarine water. Chemical and biological contaminants have been included as well as physical parameters. (Woodard-USGS)
W73-09268

HYDRAULIC EQUIVALENT SEDIMENT ANALYZER (HESA),
Massachusetts Univ., Amherst.
F. S. Anan.
Available from NTIS, Springfield, Va 22151 AD-748 652 Price $3.00 printed copy; $1.45 microfiche.

Coastal Research Center Technical Report No 3-CRC, July 1972. 38 p, 4 fig, 6 tab, 23 ref.

Descriptors: *Sediments, *Particle size, *Sediment yield, *Instrumentation, Design, Analytical techniques, Data collections, Methodology, Automation, Data transmission, Charts, Sedimentation, Settling velocity, Measurement.
Identifiers: *Sediment analyzer (HESA).

In 1966 construction began on the sediment settling tube (HESA) now being used by the Coastal Research Center, University of Massachusetts. The tube was built to circumvent the disadvantages and inadequacies of sieves, as well as some of the existing settling tubes. The HESA is a sensitive relay-recording settling tube that provides the following features: (1) a continuous cumulative curve based on the hydraulic equivalence of the sediment particles; (2) a long fall distance, 200 cm, which permits adequate separation of the grains; (3) a large internal diameter of the tube, 20.32 cm, which, in conjunction with a venetian blind gate, allows the use of a representative sample of about 20 grams; (4) a chart ten inches wide which enables detection of minor variations in the cumulative curve; (5) an initial weighing station which provides the use of the full width of the chart for each sample, regardless of its weight, and determination of the exact amount of the fine material remaining in suspension in the tube at the end of each analysis; and (6) a sensitive measurement system based on weight rather than pressure. (Woodard-USGS)
W73-09282

UNDERWATER CAMERA SYSTEM FOR DEEP-SEA BOTTOM PHOTOGRAPHY,
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
For primary bibliographic entry see Field 05A.
W73-09329

DEVICE FOR DETECTING AND MEASURING ACTIVITY OF LARGE MARINE CRUSTACEANS,
Marine Dept., Wellington, (New Zealand). Fisheries Research Div.
R. F. Coombs.
New Zealand Journal of Marine and Freshwater Research, Vol 6, Nos 1 and 2, p 194-205, June 1972. 8 fig, 12 ref.

Descriptors: *Crustaceans, *Marine animals, *Laboratory equipment, *Measurement, Invertebrates, Electrodes, Lobster, Bioassay, Research equipment, Animal physiology, Animal behavior, Voltage regulations, Water temperature, Dissolved oxygen, Electrolytes, Sea water.
Identifiers: Locomotor activity, *Sensors, *Macroinvertebrates, Detectors, Jasus edwardsii, Decapods, Arthropods, Sensitivity, Digital recording system, Recorders.

A device is described for detecting and measuring the locomotor activity of large marine crustaceans in captivity. The device consists of two electrodes: one of stainless steel, which acts as a sensing surface, and the other of aluminum immersed in a tank containing sea water. The sensor is essentially a simple galvanic cell, of which the electrolyte is the sea water in which the animal is maintained. When the cell circuit is initially closed a current flows which rapidly decreases as the cell polarizes mainly because of a build-up of hydrogen gas on the cathode. Any disturbance in the water displaces gas and the current produced by the cell increases. The activity sensor described was devised to record the activity of the spiny lobster Jasus edwardsii, and operates by detecting movements in the water and by contact of the animal with a sensing surface. It is effective in a large tank, and may be built at modest cost. It can, however, be used only for marine animals. A punched-tape recording system used with this device is also described. (Holoman-Battelle)
W73-09330

AN INSTRUMENT FOR MEASURING CONDUCTIVITY PROFILES IN INLETS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 05A.
W73-09349

SOME DISTRIBUTION-FREE PROPERTIES OF THE ASYMPTOTIC VARIANCE OF THE SPEARMAN ESTIMATOR IN BIOASSAYS,
California Univ., Los Angeles. School of Public Health.
For primary bibliographic entry see Field 05C.
W73-09359

INVERSE SAMPLING OF A POISSON DISTRIBUTION,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Mathematical Statistics.
H. Weiler.
Biometrics, Vol 28, No 4, p 959-970, December 1972. 1 fig, 1 tab, 6 ref.

Descriptors: *Sampling, *Statistical methods, Quality control, Probability.
Identifiers: *Confidence limits, *Poisson distribution, *Sample size, Precision.

Given a situation where an observation or 'trial' may result in a number X equals 0, 1, 2, ... of events or 'successes', with X a poisson variate of mean mu, a series of independent trials is conducted, resulting in X1, X2, ... successes respectively. The series is terminated as soon as the total number X1 plus X2 plus ... plus Xn of successes has reached or exceeded a preassigned number k. Let Nk be the number of trials required to reach k successes. The moments, of Nk over k to m are derived for both positive and negative integer values of m. Exact confidence limits for mu, based on Nk, are derived, and the width of the confidence interval in relation to the size of the trial unit is discussed. In applications to counts of particles in suspension, the most suitable dilution and size of the trial unit are investigated to ensure an approximate Poisson distribution. (Little-Battelle)
W73-09361

INVERSE BINOMIAL SAMPLING AS A BASIS FOR ESTIMATING NEGATIVE BINOMIAL POPULATION DENSITIES,
D. J. Gerrard, and R. D. Cook.
Biometrics, Vol 28, No 4, p 971-980, December 1972. 2 fig, 2 tab, 11 ref.

Descriptors: *Sampling, *Estimating, *Statistical methods, *Population, *Distribution pattern, Probability.
Identifiers: *Data interpretation, Poisson distribution, Variance.

A sequential sampling procedure has been developed which yields minimum-variance, unbiased estimates of a mean density population and relies solely upon the presence or absence of individuals in sampling units. Using inverse binomial samples of presence or absence, the population densities of negative binomially distributed organisms are characterized by a known parameter k. The estimator is shown to be the only unbiased, uniformly minimum variance estimator obtainable from inverse binomial samples. A comparison of its cost efficiency with that of conventional sampling indicates that the proposed technique offers a promising, economical alternative whenever direct enumeration of populations is either difficult or impractical. (Little-Battelle)
W73-09362

QUANTAL RESPONSE ANALYSIS FOR A MIXTURE OF POPULATIONS,
Exter Univ. (England).
For primary bibliographic entry see Field 05A.
W73-09363

BAYESIAN ESTIMATION AND DESIGN OF EXPERIMENTS FOR GROWTH RATES WHEN SAMPLING FROM THE POISSON DISTRIBUTION,
American Cyanamid Co., Stamford, Conn.
For primary bibliographic entry see Field 05A.
W73-09364

WATER POLLUTION MONITORING,
California Univ., Berkeley. Dept. of Geoscience Engineering.
For primary bibliographic entry see Field 05A.
W73-09369

TEMPERATURE COEFFICIENTS AND THEIR COMPENSATION IN ION-SELECTIVE SYSTEMS,
Foxboro Co., Mass.
For primary bibliographic entry see Field 05A.
W73-09371

AQUATIC SEDIMENT AND POLLUTION MONITOR,
For primary bibliographic entry see Field 05A.
W73-09390

WATER SAMPLING DEVICE,
Department of the Navy, Washington, D.C. (assignee)
R. S. Keir.
U. S. Patent No. 3,714,830, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 907, No 1, p 55, February 6, 1973.

Descriptors: *Patents, *Sampling, Water analysis, Laboratory tests, Water quality, Pollutant identification, Water pollution.

This water sampling device utilizes an Erlenmeyer flask, which has openings at the top and bottom to permit the passage of water as it is lowered to the desired depth. The openings are regulated so as to close at the selected water depth to capture a water sample at that level. When the sampler is raised to the surface the laboratory analysis can be made in the same container. The avoidance of the need to transfer the sample to another container minimizes the likelihood of conatmination. (Sinha-OEIS)
W73-09401

FLOW-METER FOR UNDERGROUND IRRIGATION PIPELINES,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Engineering.
D. R. Arora, and M. S. Rao.
Indian J Agric Sci. Vol 41, No 11, p 914-919. 1971. Illus.
Identifiers: *Flow measurement, Flow, *Irrigation, Meters, Pipelines, Underground, Instrumentation.

A flow-meter for measuring the discharge through riser pipes of an underground-irrigation water-distribution system has been designed and developed. It is a simple instrument consisting of a metallic float with guide-sleeve, a central shaft made of brass, an indicator and a calibrated discharge, indicating plate mounted over the central shaft. Flow is directly measured in terms of ha cm/hr both under free- and submerged-flow conditions. The meter is simple to install and does not restrict the outflow from the riser.—Copyright 1973, Biological Abstracts, Inc.
W73-09423

EVALUATION OF TURBULENT TRANSFER LAWS USED IN COMPUTING EVAPORATION RATES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 02D.
W73-09434

FLIGHT TEST OF AN OCEAN COLOR MEASURING SYSTEM,
TRW Systems Group, Redondo Beach, Calif. Display and Imaging Dept.
J. S. Bailey.
Available from NTIS, Springfield, Va. 22151, AD-748 029, Price $3.00 printed copy; $0.95 in microfiche. TWR Systems Display and Imaging Department Final Contract Report to Naval Oceanographic Office, April 1969. 108 p, 52 fig, 8 tab, 14 ref. Navy Contract No N62306-69-C-0024.

Descriptors: *Remote sensing, *Oceanography, *Aerial photography, *Satellites (Artificial), *Cameras, Equipment, Testing procedures, Aircraft, Data collections, Hydrologic data, Water quality.
Identifiers: *Color photography, Color variations.

The unique advantage of the satellite for oceanic studies is the truly synoptic view of the earth's surface. This synoptic coverage is rapid and repetitive, thus eleminating the major constraints to the measurement of oceanic phenomena. TWR Systems Group of Redondo Beach, California, developed an instrument, widerange imaging spectrophotometer (WISP), capable of objectively and remotely measuring ocean color variations. This instrument has been flight tested in a light plane and is now undergoing a complete redesign preparatory to being placed in a high flying aircraft and eventually an earth resources space platform. Tabulated data for the test flights include: (1) WISP IV flight test equipment, (2) test areas, flights, dates, and instruments, (3) data from three series of photometric measurements, (4) record of water sampling, (5) imaging mode spatial resolution test data, (6) ocean color mode spatial resolution test data, (7) WISP spectral bands and wavelengths, and (8) WISP IV signal-to-noise determinations. Pertinent illustrations are also presented. (Woodard-USGS)
W73-09440

A LOSING DRAINAGE BASIN IN THE MISSOURI OZARKS IDENTIFIED ON SIDE-LOOKING RADAR IMAGERY,
Geological Survey, Rolla, Mo.
G. L. Feder, and J. H. Barks.
Available from Sup Doc, GPO, Washington, D C 20402 - Price $3.00. In: Geological Survey Research 1972, Chapter C; U S Geological Survey Professional Paper 800-C, p C249-C252, 1972. 3 fig, 3 ref.

Descriptors: *Remote sensing, *Radar, *Karst hydrology, *Terrain analysis, *Missouri, Sinks, Topography, Mapping, Surveys, Karst, Erosion, Infiltration.
Identifiers: Logan Creek basin (Mo).

Logan Creek basin, a losing drainage basin in the Missouri Ozarks, was identified by side-looking radar imagery. Because the rapid infiltration of precipitation in the Logan Creek basin reduces erosion and dissection in comparison with rates of these processes in the surrounding normal or gaining basins, the Logan Creek basin has a more uniform tone and a smoother texture on the side-looking radar imagery than the highly dissected surrounding basins. This distinctive tonal and textural contrast is useful in identifying other losing drainage basins in carbonate terranes. (Knapp-USGS)
W73-09446

REMOTE SENSING OF NEW YORK LAKES,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02H.
W73-09447

HYDROGEOLOGICAL CRITERIA FOR EVALUATING SOLID-WASTE DISPOSAL SITES IN JAMAICA AND A NEW WATER SAMPLING TECHNIQUE,
Geological Survey of Jamica, Kingston.
For primary bibliographic entry see Field 05B.
W73-09452

FUNDAMENTAL PRINCIPLES IN THE STUDY OF WATER AND SALT BALANCES OF GROUNDWATER IN IRRIGATED REGIONS (OSNOVNYYE PRINTSIPY IZUCHENIYA VODNO-SOLEVOGO BALANSA GRUNTOVYKH VOD OROSHAYEMYKH TERRITORIY),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
M. S. Alimov.
Uzbekskiy Geologicheskiy Zhurnal, No 2, p 23-28, 1971. 1 tab.

Descriptors: *Groundwater, *Water balance, *Salt balance, *Irrigated land, Water table, Groundwater recharge, Infiltration, Evaporation, Analytical techniques, Evaluation, Forecasting, Lysimeters, Maps.
Identifiers: *USSR, Uzbekistan, Golodnaya Steppe.

Several methods were employed in the 'Malek' test area of the Golodnaya Steppe hydrogeological station in Uzbekistan to study evaporation and groundwater recharge by infiltration. These included the lysimeter, heat-balance, and chloride-cobalt methods and the method of cut samples. Techniques were developed for a regional evaluation of the sources of groundwater supply and discharge for irrigated lands of the steppe and for other similar regions in the Republic. (Josefson-USGS)
W73-09464

NICKEL EXPLORATION BY NEUTRON CAPTURE GAMMA RAYS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-09480

NOVEL WET-DIGESTION PROCEDURE FOR TRACE-METAL ANALYSIS OF COAL BY ATOMIC ABSORPTION,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Mining and Safety Research Center.
For primary bibliographic entry see Field 05A.
W73-09506

A ROTARY SYSTEM FOR CALIBRATING FLOWMETERS USED FOR PLANKTON SAMPLING,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
S. M. Harrison, and A. W. H. Be.
Limnol Oceanogr. Vol 17, No 1, p 152-156. 1972. Illus.
Identifiers: Calibration, *Flow meters, *Plankton sampling.

A calibration system is described consisting of a circular tank with a rotating arm from which a flowmeter is suspended and towed at speeds that can be varied up to 250 cm/sec (5 knots). The velocity of the water movement that is generated by the friction of the correct calibration factor.--Copyright 1972, Biological Abstracts, Inc.
W73-09523

VITAL STAINING TO SORT DEAD AND LIVE COPEPODS,
Virginia Inst. of Marine Science, Gloucester Point.
D. M. Dressel, D. R. Heinle, and M. C. Grote.
Chesapeake Sci. Vol 13, No 2, p 156-159. 1972.
Identifiers: *Cladocera, *Copepods, *Sorting, Staining, Vital staining.

Intra vitam staining with neutral red dye vividly stains live copepods, providing a rapid method of sorting dead copepods from live. Organisms stained and preserved in acidic media retain coloration for several days, allowing large numbers of organisms to be leisurely sorted following bioassays. Cooling the preserved samples increases color retention. Copepods and cladocerans filter and ingest carmine particles providing an indication of feeding activity. Staining with neutral red at concentrations of 3:200,000 to 1:200,000 is relatively independent of temperature over a range of 5 to 30 C.--Copyright 1972, Biological Abstracts, Inc.
W73-09539

AERIAL THERMAL SCANNER TO DETERMINE TEMPERATURES OF SOILS AND OF CROP CANOPIES DIFFERING IN WATER STRESS,
Florida Univ., Gainesville. Dept. of Climatology.
J. F. Bartholic, L. N. Namken, and C. L. Wiegand.
Agron J. Vol 64, No 5, p 603-608, 1972. Illus.
Identifiers: *Aerial thermal scanner, *Crop canopies, Gossypium-hirsutum, *Soils, *Temperatures, Water stress.

An airplane-mounted thermal scanner was used to measure irradiance in the 8- to 14-micrometer wavelength interval over an extensively instrumented agricultural area. The area included soils differing in water and tillage condition, and replicated cotton (Gossypium Hirsutum L.) plots with a wide range of plant water stress. The scanner data were recorded on analog magnetic tape and on 70-mm film. The film densities of the various soil and cotton treatments and film calibration information were determined with a microdensitometer. The observed irradiances corresponded to cotton plant canopy temperature differences up to 6C between the most and the least water-stressed plots. The irradiance data from soils showed large differences as a function of time after tillage and irrigation. Thermal imagery offers potential as a useful aid for delineating water-stressed and nonstressed fields, evaluating uniformity of irrigation, and evaluating surface soil water conditions.--Copyright 1973, Biological Abstracts, Inc.
W73-09575

A NEW METHOD FOR THE GAS CHROMATOGRAPHIC SEPARATION AND DETECTION OF DIALKYLMERCURY COMPOUNDS-APPLICATION TO RIVER WATER ANALYSIS,
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
For primary bibliographic entry see Field 05A.
W73-09584

AUTOMATIC DATA ACQUISITION IN THE WESTERN UNITED STATES,
Soil Conservation Service, Portland, Oreg. Water Supply Forecast Unit.
For primary bibliographic entry see Field 02C.
W73-09611

APPROACHES TO MEASURING 'TRUE' SNOWFALL,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 02C.
W73-09613

GLOBOSCOPE - A NEW LOOK AROUND,
West Virginia Univ., Morgantown. Div of Forestry.
For primary bibliographic entry see Field 02B.
W73-09620

REMOTE SENSING AND DATA HANDLING--THEIR APPLICATION TO WATER RESOURCES,
International Business Machines Corp., Gaithersburg, Md.
P. A. Castruccio.
Paper, 13th Meet Panel Sci Tech, p 209-220, 1972. 12 p, 18 fig.

Descriptors: *Remote sensing, *Data collections, Data processing, Watershed management, Research and development, Economics, Water resources, Application methods, Conservation, Hydrographs, Model studies, Rainfall, Runoff forecasting, Infiltration rate, Evapotranspiration, Water sources, Water demand.
Identifiers: Environmental quality.

Remote sensing has been a useful and growing technology since the beginning of the century. Black and white, color, and infrared photography and, recently, radar imaging, have added to the technology. A potential application for remote sensing is in conservation and better utilization of water resources. The search for new water sources has been intensified but a better, more rapid means of transferring collected data into useful watershed information is needed. The technique of transferring items and quantities measured directly from imagery onto the parameters of a model is applicable to the entire spectrum of hydrological models, from the simple ones used by local governments, to the complex formulations for large watersheds. The point of applying remote sensing to determining the hydrologic regime of watersheds is 2-fold: (1) improving the predictive accuracy of instrumented and modeled watersheds; and (2) determining the hydrologic regimes of unknown watersheds, with reductions in time, labor, and costs over present methods. Watershed management is only one example of the results of applying remote sensing to environmental conservation. Finding ways to accelerate the technology evolution process, rather than the technological development of remote sensing itself, is the challenge. (USBR)
W73-09673

7C. Evaluation, Processing and Publication

WATER RESOURCE OBSERVATORY CLIMATOLOGICAL DATA WATER YEAR 1972.
Wyoming Univ., Laramie. Water Resources Research Inst.

Available from the National Technical Information Service as PB-220 252, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No. 34, February 1973. 291 p. OWRR A-001-WYO (63).

Descriptors: *Data processing, *Data collections, *Humidity, *Air temperature, *Wyoming, *Climatic data.

Temperature and relative humidity data that have been reduced from hygrothermograph charts and precipitation data from recording and nonrecording precipitation gages are presented in tabular form. Four readings per day at 0600, 1200, 1800, and 2400 hours and the maximum and minimum are presented. The mean, maximum, and minimum temperatures are also shown graphically. The reduced data are transferred to punch cards for computation and tabulating by the University of Wyoming's digital computer. The card format and computer program are presented in WyoWRRI Water Resources Series No. 8.
W73-09107

WATER RESOURCES OBSERVATORY STREAMFLOW DATA WATER YEAR 1972,
Wyoming Univ., Laramie. Water Resources Research Inst.
L. E. Allen, and V. E. Smith.

Available from the National Technical Information Service as PB-220 250, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No 32, February 1973. 29 p. OWRR A-001-WYO (62).

Descriptors: *Streamflow, Data processing, *Wyoming, *Data collections, *Flow rates, *Water level recorders.

Data from water level recorders and rated stream sections are presented for stations operated by the Wyoming Water Resources Research Institute. The reduced data are processed through the University of Wyoming's digital computer. Program output presented herein includes station identification, mean daily flows in second-feet, total monthly flows in second-foot-days, mean monthly flows in second-feet, monthly discharges in acre-feet, and annual flow in acre-feet for each water year.
W73-09109

PROCEEDINGS OF CONFERENCE ON TOWARD A STATEWIDE GROUNDWATER QUALITY SUBCOMMITTEE CITIZENS ADVISORY COMMITTEE, GOVERNORS ENVIRONMENTAL QUALITY COUNCIL.
For primary bibliographic entry see Field 05B.
W73-09113

GROUND-WATER LEVELS IN THE LOWER ARKANSAS RIVER VALLEY OF COLORADO, 1969-73,
Geological Survey, Denver, Colo.
O. J. Taylor, and R. R. Luckey.
Colorado Water Resources Basic-data Release No 29, 1973. 28 p, 1 fig.

Descriptors: *Groundwater, *Water wells, *Water levels, *Colorado, Basic data collections, Water level fluctuations, Hydrologic data, Aquifers, Well data.
Identifiers: *Lower Arkansas River Valley (Colo).

Water levels are tabulated for about 600 wells from data collected during the spring prior to the 1973 irrigation season in the lower Arkansas River Valley of Colorado. Measurements made each spring during the 4 preceding years are included to serve as references illustrating declining or rising water levels. Previous water-level measurements in about 450 other wells are also included. The lower Arkansas River valley of Colorado extends from Pueblo, Colo., to the Kansas State line, a distance of 150 miles, and occupies 450 square miles in parts of five counties. The valley-fill aquifer which is adjacent to, underlies, and is in hydraulic connection with the Arkansas River yields groundwater which is used as a supplemental supply for irrigation in the Arkansas River valley. The valley fill is as much as 300 feet thick and consists of gravel, sand, silt, and clay of Pleistocene to Holocene ages. The fill ranges from 1 to 14 miles in width and rests in a broad trough cut into the bedrock. The bedrock consists of the Pierre Shale, the Niobrara Formation, the Carlile Shale, the Greenhorn Limestone, the Graneros Shale, and the Dakota Sandstone, all of Cretaceous age. (Woodard-USGS)
W73-09123

PROCESSING FOR SPACEBORNE SYNTHETIC APERTURE RADAR IMAGERY,
Computer Sciences Corp., Huntsville, Ala.
For primary bibliographic entry see Field 07B.
W73-09124

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 3, OHIO RIVER BASIN--VOLUME 2, OHIO RIVER BASIN FROM KANAWHA RIVER TO LOUISVILLE, KENTUCKY.
Geological Survey, Washington, D.C.

Geological Survey Water-Supply Paper 2108, 1972. 700 p, 1 fig.

Descriptors: *Streamflow, *Stream gages, *Flow rates, *Hydrologic data, *Ohio River, Basic data collections, Flow measurement, Discharge (Water), Gaging stations, River basins, Surface waters, Lakes, Reservoirs, Water levels.
Identifiers: *Ohio River basin.

This volume of surface water data for the Ohio River basin from Kanawha to Louisville, Kentucky, is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1966-70 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W73-09160

HYDROGRAPHIC OBSERVATIONS IN ELKHORN SLOUGH AND MOSS LANDING HARBOR, CALIFORNIA, OCTOBER 1970 TO NOVEMBER 1971,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 05B.
W73-09162

EVALUATING AND MANAGING GROUND WATER SUPPLIES WITH MODELS AND COMPUTERS,
Dames and Moore, Los Angeles, Calif.
For primary bibliographic entry see Field 04B.
W73-09246

HYDROLOGY OF SMOOTH PLAINLANDS OF ARID AUSTRALIA.
Department of National Development, Canberra (Australia).

Hydrological Series No 6, 1972. 24 p, 4 fig, 2 plate, 3 tab, 33 ref.

Descriptors: *Hydrology, *Arid lands, *Australia, *Hydrologic data, Ecology, Classification, Methodology, Topography, Geology, Rainfall, Evaporation, Data collections, Maps, Aerial photography, Flood plains, Remote sensing.
Identifiers: *Australian plains, Land forms, Land relief, Rock types.

Hydrological situations in the smooth plains areas of Australia can be broadly categorized into 16 land type classes by an ecological classification which has been mapped for the whole area coming under the reference terms of the Australian Water Resources Council Advisory Panel. In each land type there is a repetitive microhydrology, which can be related to repetitive features of the land discernible on air photographs, and nonrepetitive macrohydrology related to regional topography and geology. The repetitive microsystems can be studied by an approach analogous to the representative basins concept (Australian Water Resources Council, 1969). Analysis would take the form of a water balance accounting (mainly of inputs and changes in soil water storage) by use of point observations on one or two transects across the microsystem. For each of the main groups in the ecological classification, the panel has defined the microsystem, estimated the number and layout of instruments, and made a tentative selection of one or more experimental sites. The panel recommends that there should be a coordinated study of the hydrology of smooth plains areas, which cover

about 45% of the Australian continent, by a program of observations and analysis concentrated at nine sites. The report sets out proposals for organization of the study program and makes detailed recommendations with regard to site selection, choice and layout of equipment, observational standards, data processing, quality control and analysis, and interpretation of results. (Woodard-USGS)
W73-09276

WATER RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1973.
Geological Survey, Austin, Tex.

Geological Survey Data report (Texas District), March 1973. 23 p.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Texas, Projects, Network design, Hydrology, Streamflow, Runoff, Water levels, Water wells, Reservoirs, Lakes, Sediment transport, Tidal streams, Gaging stations, Sites, Sampling, Water analysis, Chemical analysis, Data processing, Computers, Publications.
Identifiers: *Water resources (Tex), Fiscal year 1973.

This report describes the water-resources projects and activities of the U. S. Geological Survey in Texas for the 1973 fiscal year (July 1, 1972 to June 30, 1973). A continuing series of measurements and analyses are made of streamflow, reservoir contents, chemical quality of water, sediment in streams and reservoirs, water levels in wells, and land-surface subsidence. Modern computer techniques are being used successfully in the collection and publication of water data. By the end of the 1973 fiscal year, the following installations will be in operation: approximately 400 digital recorders at stream-gaging stations; 25 conductivity recorders; and one instrument for continuously and simultaneously monitoring and recording the water-quality characteristics of conductivity, water temperature, dissolved oxygen, and pH. The use of electronic data processing for printing and storing water records will be expanded. A total of 1,431 continuous and periodic sampling stations are planned for the Texas hydrologic-data network for records of streamflow, tide levels, chemical quality of surface waters, suspended sediment, and reservoirs by the end of fiscal 1973. A list of water-resources reports for Texas that are in preparation, released, or published during fiscal year 1973 is included. (Woodard-USGS)
W73-09278

GROUND-WATER LEVELS IN THE SOUTH PLATTE RIVER VALLEY OF COLORADO, SPRING 1973,
Geological Survey, Denver, Colo.
R. T. Hurr, and R. R. Luckey.
Colorado Water Resources Basic-Data Release No 30, 1973. 33 p, 3 fig, 1 tab.

Descriptors: *Groundwater resources, *Water levels, *Basic data collections, *Water wells, *Colorado, Water level fluctuations, Valleys, Rivers, Irrigation, Aquifers, Hydrogeology.
Identifiers: *South Platte River valley (Colo), Valley-fill aquifer.

Water-level measurements made in March 1973 in the South Platte River valley of Colorado are published in a report released by the U.S. Geological Survey. The area covered by the report extends along the South Platte River from Henderson, Colo., near Denver, to the Nebraska State line, a distance of 190 miles, and occupies 1,000 square miles in parts of Adams, Logan, Morgan, Sedgwick, Washington, and Weld Counties. Water-level measurements were made in about 1,000 wells that tap the valley-fill aquifer. Water-level measurements made in the same wells during the 4 preceding years are included to serve as reference. The aquifer supplies nearly all of the groundwater used in the South Platte River valley as a supplemental supply for irrigation. The valley fill ranges in thickness from 0 to about 300 feet; in much of the area, however, the thickness is about 50 to 200 feet. The valley fill consists of gravel, sand, silt, and clay of Pleistocene to Holocene ages. The valley fill ranges from 2 to 10 miles in width and rests in a broad trough cut into the bedrock. In northeastern Colorado bedrock consists of pre-Pleistocene sedimentary formations. A list of 29 Colorado water resources basic-data releases is included. (Woodard-USGS)
W73-09280

PROGRESS REPORT ON WATER-RESOURCES INVESTIGATIONS IN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
L. F. Land.
Open-file report (72014), 1972. 40 p, 19 fig, 1 tab, 3 ref.

Descriptors: *Water resources development, *Water supply, *Water quality, *Hydrologic data, *Florida, Hydrology, Groundwater, Surface waters, Canals, Lakes, Water utilization, Water levels, Water yield, Tidal effects, Saline water intrusion, Water table, Water wells, Hydrographs, Chemical analysis, Water pollution sources, Rainfall-runoff relationships, Urbanization.
Identifiers: *Palm Beach County (Fla).

The entire southeastern coast of Florida, of which Palm Beach County is a part is experiencing a rapid growth in population. To assure that the fresh-water supply will remain adequate, much hydrologic information is needed for water-resource management and development decisions. A hydrologic network was established in 1970 to collect data on canal discharge; water-level fluctuations in wells and canals; quality of water in wells, canals, and lakes; geologic and hydrologic characteristics of the shallow aquifer system; seawater intrusion; and tidal fluctuations. The network provides the basic information from which hydrologic interpretations can be made. In May 1971 the water-table decline in the vicinity of some well fields in the extreme northeast and southeast coastal parts of the county was severe enough to permit salty water to contaminate some wells. The water levels of canals and lakes in Palm Beach County are extensively controlled. The water quality in the shallow aquifer in the county is generally acceptable for domestic, agricultural, and industrial uses in the coastal ridge area. Dissolved solids in goundwater ranges from 250 to 300 mg/liter. (Woodard-USGS)
W73-09284

FLOODS IN MAPLE PARK QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
R. T. Mycyk, and G. L. Walter.
For sale by USGS, Washington, D C 20242 Price 75 cents. Hydrologic Investigations Atlas HA-458, 1972. 1 sheet, 9 fig, 1 map, 2 ref.

Descriptors: *Floods, *Flood data, *Streamflow, *Illinois, Hydrologic data, Maps, Flood plains, Flood frequency, Flood profiles, Flood peak, Flood stages, Curves, Topographic mapping, Flood control.
Identifiers: Maple Park (Ill).

This one-sheet atlas presents hydrologic data that can be used to evaluate the extent and depth of flooding that affect the economic development of flood plains in the Maple Park quadrangle, northeastern Illinois. The approximate areas inundated by floods are delineated on a topographic map. Inundated areas for the flood of October 1954 are shown along Union ditch No. 2, Union ditch No. 3, Virgil ditch No. 1, Virgil ditch No. 2, Virgil ditch No. 3, and several unnamed streams. This flood was reported by local residents to be the highest observed in the past 65 years. The flood boundaries on the map provide a record of historic fact that reflect channel conditions existing when the floods occurred. (Woodard-USGS)
W73-09298

FLOODS IN RILEY QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
R. T. Mycyk, and R. S. Grant.
For sale by USGS, Washington, D C 20242 Price $1.00. Hydrologic Investigations Atlas HA-464, 1972. 1 sheet, 10 fig, 1 map, 1 tab.

Descriptors: *Floods, *Flood data, *Streamflow, *Illinois, Hydrologic data, Maps, Flood plains, Flood frequency, Flood profiles, Flood peak, Flood stages, Curves, Topographic mapping, Flood control.
Identifiers: *Riley (Ill).

This one-sheet atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Riley quadrangle, northeastern Illinois. The areas inundated by floods are delineated on a topographic map. Local residents reported that the flood of June 1970 was one of the highest observed in the last 70 years on Coon Creek. The flood of June 1967 was about the highest observed in the last 50 years on Spring Creek. Greater floods than those whose boundaries are shown on the map are possible. The flood boundaries shown provide a record of historic fact that reflect channel conditions existing when the floods occurred. Other illustrated data summaries include flood height, flood discharge, flood frequency, and flood profiles. (Woodard-USGS)
W73-09299

ESTIMATION OF MICROBIAL VIABILITY,
Department of Scientific and Industrial Research, Palmerston North (New Zealand). Applied Mathematics Div.
For primary bibliographic entry see Field 05B.
W73-09360

CYCLIC ANALOG-TO-DIGITAL CONVERSION,
Motorola, Inc., Franklin Park, Ill.
J. Barnes.
Instruments and Control Systems, Vol 46, No 3, p 35-36, March 1973. 3 fig, 1 tab.

Descriptors: *Data processing, *Data transmission, *Electronic equipment, Sampling.
Identifiers: *Analog to digital converters, Converters.

Cyclic converters are continuous devices in which lists are calculated serially and an output word is always available. The conversion may be implemented in a series of successive approximation stages. To determine whether the bit at each stage is ONE or ZERO, the reference voltage, which equals half the full-scale of the converter, is subtracted from the unknown input. The difference is multiplied by -2, and is applied to a sign comparator. For the most significant bit (MSB) a negative value causes the sign comparator to generate a ONE and a positive value results in a ZERO. For all subsequent bits, the polarities are reversed. The output of the reference comparator is also applied to an absolute value circuit, to create a residue for use as the input to the next stage. The analog portion of each converter stage can be implemented with operational amplifiers. The reference comparator, sign comparator, and absolute value circuit are described. (Little-Battelle)
W73-09368

QUALITY OF STREAM WATERS OF THE WHITE CLOUD PEAKS AREA, IDAHO,
Geological Survey, Washington, D.C.
W. W. Emmett.
Water Resources Investigations 6-72, 1972. 5 sheets, 8 fig, 2 tab.

Descriptors: *Water quality, *Streams, *Sediment transport, *Idaho, *Chemical analysis, Sampling, Mountains, Discharge (Water), Low flow, Average flow, High flow, Correlation analysis, Maps, Graphical analysis, Drainage area, Topography, Geology, Water analysis, Inorganic compounds, Hydrogen ion concentration, Turbidity.
Identifiers: *White Cloud Peaks area (Idaho).

Water quality in the White Cloud Peaks area of Idaho is depicted on a series of maps. The area lies in the upper drainage basin of the Salmon River in south-central Idaho. In the center of this area are located the White Cloud Peaks, an aggregation of rugged mountains considered as part of the Sawtooth Mountain Range. Data for chemical and sediment quality of stream waters were collected in 1971. Each of the 39 water data stations was visited at least three times from late May to early October to determine water-quality conditions at times of low-, medium-, and high-water runoff. This determination included measurements of discharge and temperature and collection of water samples for analysis of dissolved chemical constituents and suspended sediment. Water quality in the study area is generally excellent. Deviations in the quality can be related to the geology, topography, and to a certain extent man-induced environmental impacts. Man's impact is graphically illustrated by the high suspended sediment concentrations at a stream site near poor road maintenance practices. (Woodard-USGS)
W73-09435

A RAINFALL CLIMATOLOGY OF HILO, HAWAII,
Hawaii Univ., Hilo. Cloud Physics Observatory.
For primary bibliographic entry see Field 02B.
W73-09585

GROUND-WATER RESOURCES OF BRAZORIA COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-09590

GROUND-WATER RESOURCES OF DONLEY COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W73-09591

THE CHEMICAL TYPE OF WATER IN FLORIDA STREAMS,
Geological Survey, Tallahasse, Fla.
M. I. Kaufman.
Florida Bureau of Geology, Map Series No 51, 1972. 1 sheet, 4 fig, 1 map, 8 ref.

Descriptors: *Water quality, *Chemical analysis, *Water types, *Florida, *Streams, Data collections, Sampling, Maps, Curves, Correlation analysis, Streamflow, Flow rates, Low flow, High flow, Inorganic compounds, Water chemistry.

This map report portrays inorganic chemical quality characteristics of Florida's streams and delineates broad regions of the State where stream waters are of similar chemical type (ionic composition) during low flow, and correlates chemical quality of surface waters with changes in streamflow and with certain natural and manmade environmental influences. The information should aid in determining areal coverage, frequency, and required types of analyses for a Statewide chemical-quality-sampling network representative of the differing hydrogeochemical environments in Florida. Water samples were collected from 1940 through 1967. Examination of long-term chemical data for selected streams indicates no significant changes in water-quality characteristics. Low flow refers to the lower 25% of flow based on the flow-duration data of Heath and Wimberly (1971). Five chemical types are described in terms of the dominant cations and anions, as: (A) calcium and magnesium bicarbonate, (B) sodium bicarbonate and chloride, (C) mixed type,--no dominant cation or anion, (D) sodium chloride and (E) calcium and magnesium sulfate. (Woodard-USGS)
W73-09594

A REPORT ON THE PROTOTYPE CURRENT VELOCITY AND SALINITY DATA COLLECTED IN THE UPPER CHESAPEAKE BAY FOR THE CHESAPEAKE BAY MODEL STUDY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W73-09595

COMPUTER MODEL FOR DETERMINING BANK STORAGE AT HUNGRY HORSE RESERVOIR, NORTHWESTERN MONTANA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04A.
W73-09600

CLIMATE OF THE POTOMAC RIVER BASIN AND CLIMATOLOGICAL SUMMARIES FOR SPRUCE KNOB, WARDENSVILLE, ROMNEY AND MARTINSBURG, WEST VIRGINIA,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 02B.
W73-09602

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE STERLING REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-09605

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE BRUSH REACH OF THE SOUTH PLATTE RIVER VALLEY, COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 04B.
W73-09606

TIDAL DATUM PLANES AND TIDAL BOUNDARIES AND THEIR USE AS LEGAL BOUNDARIES -- A STUDY WITH RECOMMENDATIONS FOR VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02L.
W73-09609

THE MAPPING OF SNOWFALL AND SNOW COVER,
Atmospheric Environment Service, Ottawa (Ontario).
For primary bibliographic entry see Field 02C.
W73-09616

FLOODS IN THE RIO GUANAJIBO VALLEY, SOUTHWESTERN PUERTO RICO,
Geological Survey, Washington, D.C.
W. J. Haire.
For sale by Geological Survey Price 75 cents, Washington, D.C. 20242. Hydrologic Investigations Atlas HA-456, 1972. 1 sheet, 7 fig, 2 ref.

Descriptors: *Floods, *Flood plains, *Streamflow, *Hydrologic data, *Puerto Rico, Flood damage, Maps, Flood frequency, Flood profiles, Flood peak, Flood stages, Flood data, Topographic mapping.
Identifiers: *Rio Guanajibo Valley (Puerto Rico).

This one-sheet atlas provides factural and interpretive information that will aid administrators, planners, engineers, and other interested persons concerned with future development in areas subject to flooding in the Rio Guanajibo basin, Puerto Rico. The study area lies in the southwestern part of the Puerto Rico and encompasses about 90 square miles of land area. Floods that have inundated sizable areas since 1928 and for which some water-surface elevation data are available occurred in 1943, 1945, 1952, 1954, 1958, 1960, 1963, 1967, and 1968; but records are too fragmentary to determine accurate water-surface profiles for any flood except the flood of July 30, 1963. The 1963 flood is the 7th highest of record. The area inundated by the flood is delineated on a topographic map. The flood boundary on the map was developed from historical data and reflects the channel and flood-plain conditions that existed at that time. Fourteen highway bridges are in the valley, 11 of which cross Rio Guanajibo. The water surface during this flood was above low steel on five of these bridges, and two of the five bridges were completely inundated. (Woodard-USGS)
W73-09618

GEOHYDROLOGY OF SUMTER, DOOLY, PULASKI, LEE, CRISP, AND WILCOX COUNTIES, GEORGIA,
Geological Survey, Washington, D.C.
R. C. Vorhis.
For sale by Geological Survey Price $1.00 per set, Washington, D.C. 20242. Hydrologic Investigations Atlas HA-435, 1972. 2 sheets, 3 fig, 2 tab, 13 ref.

Descriptors: *Groundwater resources, *Aquifers, *Water yield, *Water quality, *Georgia, Water wells, Test wells, Pumping, Drawdown, Groundwater recharge, Aquifer characteristics, Mapping, Geology, Hydrogeology, Hydrologic data, Water resources development.
Identifiers: *Sumter Co (Ga), *Dooly Co (Ga), Pulaski Co (Ga), Lee Co (Ga), Crisp Co (Ga), Wilcox Co (Ga).

The increasing use of Interstate Highway 75 through Georgia has generated the drilling of many wells to supply water for light industry, motels, and restaurants. Furthermore, a recent increase in groundwater use for supplementary irrigation has created a need for information on the required depths of wells, the amount of water to be expected, and the quality of the obtainable water. This 2-sheet atlas was prepared to make such information publicly available. The illustrations provide information on the geologic formations from which water is obtainable, their depth, and the probable quantity and quality of the water. The total water recharge per year for the 2,266 square-mile area is about 80 billion gallons. In order to use this annual recharge to the maximum, ideally spaced wells would have to be pumped continuously at a rate of 150,000 gallons per minute. An estimate of water use suggests that less than 10% seeable future, water quantity will not be a limiting factor in the economic growth of the six-county area in southwest Georgia. (Woodard-USGS)
W73-09619

ELEVATION IN WEST VIRGINIA,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 02B.
W73-09621

AGRICULTURAL RESPONSE TO HYDROLOGIC DROUGHT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03F.
W73-09678

1972 ARIZONA AGRICULTURAL STATISTICS,.
Arizona Crop and Livestock Reporting Service, Phoenix.
For primary bibliographic entry see Field 03F.
W73-09687

08. ENGINEERING WORKS

8A. Structures

WATER WELL CONSTRUCTION AND DESIGN,
Dames and Moore, San Francisco, Calif.
W. A. Thomas.
Engineering Bulletin 35, p 8-15, 1969. 12 fig, 5 ref.

Descriptors: Wells, *Water wells, Pump testing, *Well screens, Aquifer testing, Well casing, Rotary drilling, Drilling, Drilling fluids, *Drilling equipment, Groundwater.
Identifiers: Well development, *Well design, Gravel packing, Surging, Jetting.

Before designing a well, it is necessary to determine: (1) Quantity of water required; (2) Future water requirements; (3) Peak consumption expected; (4) Quality of the water in the production areas - effect on well design and treatment needed; (5) Desired location of the well. A step-by-step analysis of well installation is given--both cable tool and rotary drilling are covered with advantages and disadvantages of each; recommended well diameters for a range of desired well yields and the size of pump bowls needed are given; well intake sections and their functions are described. An ideal well should have a well screen with as much open area as possible, and up to 60 percent of smaller particles should be drawn through the screen, thereby forming a natural gravel pack. Seventy to eighty percent of the thickness of the water bearing formation should be screened. Ordinary chemical analysis of water will not furnish all the information required to determine its corrosive or incrusting properties. It is also necessary to measure dissolved gases, pH, and activity index of the water. Surge and water-jet development of wells is covered, along with test pumping. (Campbell-NWWA)
W73-09245

WHAT EXPERIENCE TEACHES US ABOUT INCRUSTATION,
Universal Oil Products, St. Paul, Minn. Johnson Div.
J. L. Mogg.
The Johnson Drillers Journal, May-June, 1971, p 3,4. 1 fig, 1 tab, 2 ref.

Descriptors: Wells, *Water wells, Calcium carbonate, Calcium sulfate, Iron, *Iron bacteria, Magnesium carbonate, Manganese, Stainless steel, Equilibrium, *Well screens.
Identifiers: *Incrustation, Hydrochloric acid, Sulfamic acid, Well development, Shock chlorination, Ferric hydroxide.

The most common cause of decrease in well capacity is clogging of the water-bearing formation around the wellbore and clogging of the openings in the well screen. This occurrence is called incrustation. Precipitation reactions for calcium and magnesium carbonates, iron, and maganese are given. The common belief that non-metallic casing and screen does not incrust is refuted by case examples. Recommendations for the minimization of mineral incrustation are: (1) Use screens with the most possible open area; (2) Reduce drawdown through maximization of well efficiency; (3) Reduce drawdown by limitation of pumping rate; (4) Provide periodic chemical treatment; and (5) Keep oxygen away from the screen section of the well by the use of packers or vacuum seals. Since incrustation from manganese, magnesium carbonate, and calcium sulfate are rare in water wells, types emphasized are the calcium carbonate and ferrous or ferric hydroxide incrustations. The problem of incrustation by growth of iron bacteria Gallionella, Crenothrix, and Leptothrix is outlined. (Campbell-NWWA)
W73-09250

WAVE DAMPING EFFECTS OF FIBROUS SCREENS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-09437

A TALK ON THE FINITE ELEMENT METHOD AND GEOTECHNICAL ENGINEERING IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08G.
W73-09668

SHORTCUT PIPELINE MODIFICATION CONTRA COSTA CANAL UNIT, CENTRAL VALLEY PROJECT, CALIFORNIA (FINAL ENVIRONMENTAL STATEMENT).
Bureau of Reclamation, Washington, D.C.

Available from National Technical Information Service, U.S. Dept. of Commerce as EIS-CA-72-5493-F, for $3.75 paper copy, $0.95 microfiche. October 16, 1972. 15 p, 1 map, 2 append.

Descriptors: *California, *Pipelines, *Water supply, *Project planning, *Environmental effects, Closed conduits, Piping systems (Mechanical), Water utilization, Pipes, Pollution abatement, Economics, Programs, Water allocation (Policy), Water delivery, Project purposes, Zoning, Recreation, Canals, Water supply development, Water shortage, Water management (Applied), Water distribution (Applied).
Identifiers: *Socioeconomic development, *Environmental impact statement, *Central Valley Project (Calif.).

The existing Contra Costa Canal has not the capacity to supply the present demand for water in the Martinez, California, portion of its service area. To meet this need, the construction of a buried pipeline, through the urban Concord area, has been begun. The pipeline will supply the increasing needs of the Martinez urban and industrial areas. The right-of-way will be available for development as a green belt or part of a recreational trail system. The pollution potential of increased urbanization and industralization of the area has been recognized, and discharges are under the regulation set by the California Water Pollution Control Board. Alternatives to the present plan which were considered were either: (1) the enlargement of the existing canal; or (2) no charge in the existing situation. Without the pipeline, existing and planned economic development in the area would be restricted and the socioeconomic environment of the area impaired. The area adjoining almost all of the pipeline right-of-way has been committed to industrial development. The subsurface of the right-of-way is committed to pipeline use. Water rights associated with the service area are already in existence. The comments of interested agencies are included in the statement. (Reed-Florida)
W73-09696

PROSPERITY LAKE, SPRING RIVER AND TRIBUTARIES, MISSOURI-KANSAS-OKLAHOMA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Tulsa, Okla.

Available from National Technical Information Service, U.S. Dept. of Commerce as EIS-MO-72-5277-F, for $3.75 paper copy, $0.95 microfiche. April 14, 1971. 33 p, 2 tab.

Descriptors: *Flood control, *Artificial lakes, *Federal project policy, *Water supply, *Environmental effects, Missouri, Kansas, Oklahoma, Water policy, Dams, Flood damage, Reservoirs, Water resources development, Water quality, Recreation, Water sports, Recreation facilities, Project planning, Project purposes, Ecology.
Identifiers: *Spring River (Mo.-Kan.-Okla.), *Environmental impact statement, National Environmental Policy Act.

The proposed project would result in the construction of a dam and the creation of an artificial lake along a valley bottom located on the northwestern flank of the Ozark uplift in the Ozark Plateau. Flood control, water supply and recreation are the project's purposes. The project will provide millions of gallons of good quality water daily to the residents of the Joplin-Carthage area and will increase the agricultural productivity of the area, thereby raising the living standard of the rural residents. The project will also provide an opportunity for water-related recreational development. The project would necessitate the innundation of several thousand acres of land and the relocation of one cemetery and various utilities. Considered as alternatives to the proposed project were levees, an exclusive upstream flood control program, flowage easements, and alternative lake sites. The only known irreversible commitment of resources would be the covering of 1,880 acres of land and streams and their associated ecosystems with the project structures and water. The comments of interested federal and state agencies are included in the statement. (Reed-Florida)
W73-09698

CORNUDAS, NORTH AND CULP DRAWS WATERSHED, HUDSPETH COUNTY, TEXAS AND OTERO COUNTY, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from National Technical Information Service, U.S. Dept. of Commerce as EIS-NM-72-5708-F, for $5.00 paper copy, $0.95 microfiche. November 29, 1972. 29 p, 1 plate, 1 tab, 1 append.

Descriptors: *Texas, *New Mexico, *Environmental effects, *Watershed management, Flood prevention, Erosion, Runoff, Irrigation, Wildlife habitat, Agricultural land, Flood control, Flood plain management, Land use, Soil conservation, Land resources, Land development, Watersheds (Basins), Water supply, Habitat improvement, Governmental interrelations.
Identifiers: *Environmental impact statement, Hudspeth County (Texas), Otero County (N.M.), Interstate projects.

The project proposes land treatment measures within the existing watershed supplemented by three floodwater retarding structures for the purpose of watershed protection and flood prevention in Hudspeth County, Texas, and Otero County, New Mexico. The project will reduce erosion and runoff; reduce the waste of irrigation water; improve big game habitat; reduce floodwater damages on about 14,173 acres by 84%; reduce sediment deposition damage by 88%; reduce scour damage by 65%; provide protection to Dell City from all floods up to and including the 100-year event; provide an average annual 2,700 acre-feet of groundwater recharge; and reduce future energy needs associated with water desalinization in

Dell City. Adverse effects include losting 483 acres of agricultural land and interrupting agricultural use on an additional 811 acres. Alternatives considered to the proposed project include less intensive use of the flood plain, an alternate combination of a larger number of smaller structures, and the construction of channels to carry released floodwater across the highly developed flood plain. Comments of interested state and federal agencies are included. (Mockler-Florida)
W73-09699

OMNIBUS WATER RESOURCES AUTHORIZATIONS--1972, PARTS I AND II.
For primary bibliographic entry see Field 06E.
W73-09709

8B. Hydraulics

EFFECTS OF RIVER CURVATURE ON A RESISTANCE TO FLOW AND SEDIMENT DISCHARGES OF ALLUVIAL STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 02E.
W73-09102

ELACTIC EFFECTS IN FLOW OF VISCOELASTIC LIQUIDS,
Delaware Univ., Newark. Dept of Chemical Engineering.
M. M. Denn, and K. C. Porteous.
Chemical Engineering Journal, Vol 2, p 280-286, 1971. 5 fig, 28 ref.

Descriptors: *Fluid mechanics, *Fluid friction, *Viscosity, *Pipe flow, *Elasticity (Mechanical), Flow, Turbulence, Shear drag, Mathematical models, Equations, Reynolds Number, Design criteria.
Identifiers: *Fluid elasticity.

In design for systems involving viscoelastic liquids it is necessary to have available simple estimates of when deviations from inelastic behavior might be expected. The traditional engineering approach is through dimensional analysis. A basic approach to dimensional analysis estimation in viscoelastic liquid flows is based upon considerations of information transport in such systems. The shear wave velocity is the relevant elastic parameter. As a result of this approach it seems possible to bring within a common framework the appearance and correlation of a diversity of phenomena broadly attributable to fluid elasticity, including low Reynolds Number instability in melts and turbulent drag reduction in dilute polymer solutions. The influence of fluid elasticity on information transport is best illustrated by the development of velocity profile between infinite parallel plates, both initially at rest, when one is suddenly set in motion at a constant velocity. (Woodard-USGS)
W73-09133

HORIZONTAL FORCES DUE TO WAVES ACTING ON LARGE VERTICAL CYLINDERS IN DEEP WATER,
Naval Undersea Center, San Diego, Calif.
E. R. Johnson.
Available from NTIS, Springfield, Va 22151 AD-751 574 Price $3.00 printed copy; $0.95 microfiche. Report NUC TP 322, October 1972. 15 p, 4 fig, 2 tab, 31 ref.

Descriptors: *Waves (Water), *Deep water, *Ocean waves, *Floats, Model studies, Mathematical models, Equations, Correlation analysis, Hydrologic data, Methodology, Design criteria, Engineering structures.
Identifiers: *Ocean platforms, *Floating platforms.

Wave forces on vertical cylinders are due to both viscous and inertial effects. The problem appears to be considerably simplified when the forces are predominantly inertial. In general, the inertial forces predominate as cylinder diameter and water depth increase. A column-stabilized floating ocean platform presents such a case. An expression for the maximum horizontal wave force on large-diameter circular cylinders mounted vertically in deep water was analytically derived. Experimental model studies were also conducted and the resulting measured forces were within 20% of predicted forces. The maximum horizontal force due to waves is proportional to the square of the cylinder diameter when the maximum force is inertial. The force distribution is concentrated near the surface. About one-half the possible maximum force on the cylinder occurs in the first one-tenth wavelength of depth from the water surface. For the first one-tenth wavelength (200 ft for a 20-sec wave) of depth, the force distribution is almost linear with depth. For platform buoyancy columns, the horizontal forces due to waves are about proportional to the column length and the square of the diameter. Therefore, wave force considerztions should not be a factor in column proportioning since for a given column buoyancy, the force would be about the same regardless of the length-to-diameter ratio. However, the magnitude and distribution of the wave forces on the vertical cylinders do need to be known for the structural design. (Woodard-USGS)
W73-09166

PLANNING AND DEVELOPING GROUND WATER SUPPLIES,
Dames and Moore, Inc., New York.
For primary bibliographic entry see Field 04B.
W73-09243

WATER SUPPLY AND GROUND WATER UTILIZATION IN FOREIGN COUNTRIES,
Dames and Moore, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W73-09244

WATER WELL CONSTRUCTION AND DESIGN,
Dames and Moore, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W73-09245

EVALUATING AND MANAGING GROUND WATER SUPPLIES WITH MODELS AND COMPUTERS,
Dames and Moore, Los Angeles, Calif.
For primary bibliographic entry see Field 04B.
W73-09246

GROUNDWATER HYDRAULICS OF EXTENSIVE AQUIFERS,
For primary bibliographic entry see Field 04B.
W73-09263

FLEXIBLE ROUGHNESS IN OPEN CHANNELS,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
N. Kouwen, and T. E. Unny.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 99, No HY5, Paper 9723, p 713-728, May 1973. 8 fig, 1 tab, 12 ref, append.

Descriptors: *Open channel flow, *Roughness (Hydraulic), *Vegetation, *Hydraulic models, Flumes, Aquatic plants, Flow resistance, Fluid friction, Roughness coefficient.
Identifiers: *Flexible roughness (Hydraulic).

The logarithmic flow formula for open channels is valid for flow over a roughness cover made up of flexible plastic strips representing vegetation. The deflection of such roughness directly influences the relative roughness. Dimensionsless parameters relate the amount of bending to the stiffness of the roughness and the boundary shear. Three regimes of boundary behavior were observed for flexible plastic roughness, leading to two resistance functions. The flexible plastic roughness was produced by thin plastic strips of various thickness on the bed of a flume. (Knapp-USGS)
W73-09271

WAVE DAMPING EFFECTS OF FIBROUS SCREENS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. H. Keulegan.
Available from NTIS, Springfield, Va. 22151, AD-751 133 Price $3.00 printed copy; $0.95 in microfiche. Army Engineer Waterways Experiment Station Research Report H-72-2, September 1972. 105 p, 35 fig, 18 tab, 9 ref.

Descriptors: *Waves (Water), *Harbors, *Control structures, *Hydraulic models, Design criteria, Engineering structures, Analytical techniques, Materials, Testing procedures, Filters, Resistivity, Mathematical studies, Equations.
Identifiers: *Wave absorbers, *Wave filters, Fibrous materials.

This is the second of three reports planned on the design of filters and wave absorbers of the type used in harbor wave-action models as a part of the Civil Works Investigation, Engineering Study 833, sponsored by the Office, Chief of Engineers, U.S. Army. Expressions are derived for the damping of essentially translatory waves by screens prepared from fibrous materials such as aluminum wool, rubberized hair, and polyurethane foam. The derivations involve either the resistance coefficients or the permeabilities of these materials. With the aluminum wool the sampling is exponential and yields expressions admitting logarithmic decrements. A comparison is made with the Biesel theory of decay in porous media. With the foams the damping is also exponential; on the other hand, with the rubberized hair the damping is best described in terms of a power formula. (Woodard-USGS)
W73-09437

GRAYS HARBOR ESTUARY, WASHINGTON: REPORT 3, WESTPORT SMALL-BOAT BASIN STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. J. Brogdon, Jr.
Available from NTIS, Springfield, Va. 22151, AD-748 814, Price $3.00 printed copy; $0.95 in microfiche. Army Engineer Waterways Experiment Station Technical Report H-72-2, September 1972. 152 p, 116 plate, 22 photo, 1 tab.

Descriptors: *Coastal engineering, *Harbors, *Recreation facilities, *Washington, *Estuaries, Model studies, Channel improvement, Environmental effects, Ecology, Data collections, Hydraulic models, Currents (Water), Shoals, Path of pollutants, Sewage, Outfall sewers.
Identifiers: *Grays Harbor (Wash).

The existing, comprehensive fixed-bed model of the Grays Harbor estuary was used to determine current velocities, surface current patterns, flushing and dispersion characteristics, and qualitative shoaling rates and patterns for four small-boat basin plans located near Westport, Wash. With the increased interest in sport fishing in this area and expansion of the charter boat and commercial fishing industry, this small-boat harbor no longer has the capacity to serve the ever-increasing number of boats desiring anchorage; therefore, there is a need for expanding this facility. Model tests indicate that only insignificant local changes in current velocities and surface current patterns outside

the proposed basins would result from construction of any of the four small-boat basin plans. Waste material discharged from the proposed Westport sewage outfall would enter the proposed basin during both ebb and flood currents, but maximum concentrations in the basin would only be on the order of 0.01 percent of the initial concentration at the outfall. (See also W72-14727) (Woodard-USGS)
W73-09438

INVESTIGATIONS OF MORPHOLOGY AND HYDRAULICS OF RIVER CHANNELS, FLOOD PLAINS, AND BODIES OF WATER FOR STRUCTURAL DESIGN (ISSLEDOVANIYA MORFOLOGII I GIDRAVLIKI RECHNYKH RUSEL, POYM I VODOYEMOV DLYA NUZHD STROITEL' NOGO PROYEKTIROVANIYA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 190, Popov, I. V., and Snishchenko, B. F., editors, Leningrad, 1972. 235 p.

Descriptors: *Hydraulics, *Structural design, *Channel morphology, *Flood plains, *Sediment transport, Bodies of water, Banks, Meanders, Braiding, Discharge (Water), Floods, Flow, Waves (Water), Winds, Water levels, Reservoirs, Dunes, Sand waves, Model studies, Aerial photography, Computers.
Identifiers: *USSR, Kinematics, Kinematic waves, Sand ridges.

Channel and flood-plain processes and reservoir dynamics are investigated in this collection of 15 papers prepared at the State Hydrologic Institute's Department of Channel Processes. The topics discussed include general morphology of river channels and flood plains; river-channel stability and kinematic waves; wind waves and variable water levels; movement of bottom sediments in channel flow; kinematics of flow above sand ridges; turbulence of wind currents; and flattening of flood waves in rivers with a deformable channel. Investigations of flood-plain inundation are based on use of aerial photography and computation of unsteady flow by computers. (Josefson-USGS)
W73-09460

ICE-JAM INVESTIGATIONS AND COMPUTATIONS. PROBLEMS OF ICE ENGINEERING AND HYDRODYNAMICS (ISSLEDOVANIYA I RASCHETY ZATOROV I ZAZHOROV L'DA. VOPROSY LEDOTERMIKI I GIDRODINAMIKI).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 192, Chebotarev, A. I., editor, Leningrad, 1972. 248 p.

Descriptors: *Ice jams, *Ice, *Engineering, *Hydrodynamics, *Hydraulics, Hydraulic structures, Cantilevers, Channels, Discharge (Water), Hydroelectric plants, Tailwater, Cooling towers, Thermal conductivity, Turbulence, Velocity, Peat, Navigation, Floats, Measurement, Model studies.
Identifiers: *USSR, Ice control, Ice properties, Ice floes, Aerodynamics, Isolines.

Formation of ice jams and engineering applications of ice are investigated in this collection of 25 papers published by the State Hydrologic Institute in Leningrad. Among the subjects discussed are: (1) model studies of ice decay; (2) use of analog models to measure ice cover in tension; (3) characteristics of ice-jam formation in mountain streams; (4) ice jams in tailwater channels of hydroelectric plants; (5) ice-engineering conditions during design, construction, and operation of hydroelectric plants; (6) flexure of a cantilever and viscosity of ice; (7) construction of ice-engineering installations on rivers in northern Siberia; (8) formation of ice on foreign surfaces; (9) stability of frozen peat; (10) extension of navigation periods on inland waterways; (11) aerodynamics of cooling towers; (12) remote-control measurement of water discharge in large-diameter pipes; and (13) measurement of small flow velocities by pressure floats. (Josefson-USGS)
W73-09461

HYDROMORPHOLOGICAL INVESTIGATIONS OF FLOOD-PLAIN AND CHANNEL PROCESSES (GIDROMORFOLOGICHESKIYE ISSLEDOVANIYA POYMENNOGO I RUSLOVOGO PROTSESSOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 195, Snishchenko, B. F., editor, Leningrad, 1972. 99 p.

Descriptors: Investigations, *Flood plains, *Channels, *Channel morphology, *Hydraulics, Floods, Bodies of water, Meanders, Braiding, Water levels, Flow, Currents (Water), Reservoirs, Statistical methods, Probability, Aerial photography, Analytical techniques, Instrumentation, Digital computers, Model studies, Laboratories.
Identifiers: *USSR, Profilographs.

Results are presented of research conducted by scientific workers and graduate students at the State Hydrologic Institute's Department of Channel Processes, Investigations of the morphology and hydraulics of channels, flood plains, and bodies of waters are based on the use of aerial photography and digital computers. A description is given of an ultrasonic profilograph for use in erodible-model studies in channel laboratories. (Josefson-USGS)
W73-09462

GENERAL REPORT ON WATER RESOURCES SYSTEMS: OPTIMAL OPERATION OF WATER RESOURCES SYSTEMS,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 02A.
W73-09588

THE EFFECT OF MIXING AND GRAVITATIONAL SEGREGATION BETWEEN NATURAL GAS AND INERT CUSHION GAS ON THE RECOVERY OF GAS FROM HORIZONTAL STORAGE AQUIFERS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 04B.
W73-09589

CONSIDERATIONS OF PIPELINE TENSION TIE PROBLEMS,
Santa Clara County Flood Control and Water District, San Jose, Calif.
For primary bibliographic entry see Field 08G.
W73-09671

ORIFICE LOSSES FOR LAMINAR APPROACH FLOW,
Indian Inst. of Science, Bangalore (India).
N. S. L. Rao, and K. Sridharan.
Proc Am Soc Civ Eng, J Hydraul Div, Vol 98, No HY11, p 2015-2034, Nov 1972. 20 p, 13 fig, 19 ref, 2 append.

Descriptors: *Orifices, *Orifice flow, *Laminar flow, Turbulent flow, Reynolds number, Research and development, Basic research, Pipe flow, Fluid mechanics, Curves, Bibliographies.
Identifiers: India, Foreign studies.

Very little information is available on variability of loss coefficient with changing Reynolds number for valves, contractions, expansions, and bends. The reported studies deal with laminar approach flow to several types of orifices, including sharp-edged concentric, eccentric and segmental, quadrant-edged concentric, and square-edged long. Flow medium was oil in a 36.6-mm-dia pipe. Reynolds number was varied from 10 to 2,000. The ratio of orifice diameter to pipe diameter varied from 0.2 to 0.8. The loss coefficient curves for several orifices give an indication of the critical Reynolds number at which flow immediately downstream of the orifices becomes turbulent even though the approach flow is laminar. The effects of Reynolds number, orifice-to-pipe diameter ratio, edge radius, eccentricity, segmental opening, and orifice length are studied. Numerous curves of loss coefficient versus Reynolds number are given for each orifice. (USBR)
W73-09672

8C. Hydraulic Machinery

FLUID TREATMENT DEVICES,
For primary bibliographic entry see Field 05D.
W73-09399

USE OF CARRIER LINE TRAPS WITH NO TUNING PACKS,
Tennessee Valley Authority, Chattanooga.
A. B. Bagwell, and H. I. Dodson.
Inst Electra Electron Eng Trans Power Appar Syst, Vol PAS-91, No 6, p 2305-2312, Nov-Dec 1972. 8 p, 15 fig, 4 ref, disc.

Descriptors: *Powerline carriers, *Transmission lines, Carrier-current, Carriers, Power operation and maintenance, Communication, Protective relaying, Tests, Extra high voltage, Instrumentation.
Identifiers: *Line traps, Tuning.

On construction projects involving changes to existing facilities, removing power transmission lines from service often becomes necessary so that carrier coupling can be modified or line traps retuned. Even more frequently necessary is taking powerline outages for line trap maintenance because of defective tuning packs. Ever since line traps were first used with powerline carrier, tuning packs have been the weakest link. A tuning scheme that uses a self-resonant line trap coil as 1 leg of a pi-section bandpass filter to eliminate line trap tuning pack problems is described and compared with other approaches. Results illustrate that a carrier circuit can be coupled successfully to a powerline without susceptibility to line trap tuning pack failure and without degrading the characteristics of the carrier channel. (USBR)
W73-09665

8D. Soil Mechanics

EFFECT OF SEEPAGE STREAM ON ARTIFICIAL SOIL FREEZING,
University Engineers, Inc., Norman, Okla.
For primary bibliographic entry see Field 02G.
W73-09454

EARTHQUAKE RESISTANCE OF EARTH AND ROCK-FILL DAMS: REPORT 2. ANALYSIS OF RESPONSE OF RIFLE GAP DAM TO PROJECT RULISON UNDERGROUND NUCLEAR DETONATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
J. E. Ahlberg, J. Fowler, and L. W. Heller.
Available from NTIS, Springfield, Va 22151 AD-744 420 Price $3.00 printed copy; 95 cents microfiche. Miscellaneous Paper S-71-17, June 1972. 132 p, 22 fig, 66 plate, 4 tab, 10 ref.

Descriptors: *Dams, *Movement, *Nuclear explosions, *Underground, *Colorado, Correlation analysis, Model studies, Earthquakes, Mathematical models, Data collections, Forecasting, Earth dams, Rockfille dams, Design criteria, Engineering structures, Hydraulic structures.
Identifiers: *Rifle Gap Dam (Colo).

The motion of Rifle Gap Dam in Colorado was measured in September 1969 during the Project Rulison underground nuclear explosion. The observed response was then compared with the response computed in a mathematical model. Observed and computed responses were similar. From this study it appears that the mathematical models used are applicable to the design and analysis of soil structures, at least for ground motion intensities comparable to those observed at Rifle Gap Dam. The type of material used, sand or clay, determined the relationship used to modify the material properties for shear strain level. For the foundation material at Rifle Gap Dam, better agreement with the observed data was obtained by considering the material as sand. The granular material was present in both Bu Rec borings, but cohesive material was also present and results comparable to those observed could be obtained only by multiplying the cohesive modulus by a factor of 1.875, which actually gave about the same modulus as that for the sand curves at that shear strain level. (Woodard-USGS)
W73-09604

FINITE ELEMENT ANALYSES OF STRESSES AND MOVEMENTS IN DAMS, EXCAVATIONS AND SLOPES (STATE-OF-THE-ART),
California Univ., Berkeley.
J. M. Duncan.
Paper, Appl Finite Elem Method Geotech Eng, Proc Symp, Vicksburg, Miss, May 1972, p 267-326, Sept 1972. 60 p, 16 fig, 67 ref, 2 append.

Descriptors: *Finite element analysis, *Stress analysis, *Slopes, *Slope stability, Earth dams, Rockfill dams, Deformation, Settlement (Structural), Excavation, Earth pressure, Pore pressure, Costs, Reviews, Bibliographies, Stability, California.
Identifiers: Buena Vista Pump Plt (Calif), Scammonden Dam, Great Britain, Hydraulic fracturing, Nonlinear properties, Oroville Dam (Calif).

Until the finite element method (FEM) was devised, geotechnical problems involving nonhomogeneous and nonlinear materials, complex boundary conditions, and sequential loading were considered impossible to analyze realistically. In analyzing the behavior of embankment and excavation slopes, FEM can be used to predict: (1) movements and earth pressures, (2) locations likely to crack, (3) locations susceptible to hydraulic fracturing, (4) pore pressure changes for undrained conditions, and (5) local failure and stability. The most significant limitation on the accuracy of geotechnical FEM analyses is caused by a limited ability to represent the stress-strain behavior of soils and rocks. Methods for modeling the stress-strain behavior include: linear elastic, successive approximations, successive increments, bilinear, hyperbolic, and spline functions. FEM examples given are: (1) a slope stability analysis of the Buena Vista Pumping Plant excavation in alluvium, (2) slope stability analysis of the failure of a canal constructed in highly plastic clay, (3) movement prediction and observation at Scammonden Dam, (4) movement prediction for a soft clay test fill loaded to failure, and (5) movement prediction and observation of Oroville Dam during construction and reservoir filling. (USBR)
W73-09666

APPLICATIONS OF FINITE ELEMENT ANALYSES IN SOIL DYNAMICS (STATE-OF-THE-ART),
California Univ., Berkeley.
H. B. Seed, and J. Lysmer.
Paper, Appl Finite Elem Method Geotech Eng, Proc Symp, Vicksburg, Miss, May 1972, p 885-912, Sept 1972. 28 p, 11 fig, 35 ref, append.

Descriptors: *Soil dynamics, *Finite element analysis, *Seismic design, *Damping, Earth dams, Slope stability, Stress analysis, Seismic waves, Vibrations, Seismology, Engineering geology, Bibliographies, Dynamics, Faults (Geologic), Earthquake engineering.
Identifiers: Computer-aided design, Caracas (Venezuela), Blast loads, Soil-structure interaction, *Damping.

This review of finite element analyses emphasizes efforts in the fields of earthquake engineering, seismology, blast effects on structures, and foundation vibrations. To obtain meaningful results from the analyses, correct representations are needed of the soil stress-strain and damping properties. Seismic stability analyses of earth dams and slopes can be used to compute stress time histories for both rigid and traveling wave base motions. Other earthquake studies analyze surface accelerations of soil deposits underlain by sloping rock boundaries. Recent seismological analyses include the ground vibrations produced by a fault rupture and the influence of structural irregularities on the propagation of surface waves. Classical analyses of foundation vibration problems have been limited to rigid circular footings resting on a homogeneous half-space, but with the finite element method, footings can be analyzed that are resting on layered soil deposits or embedded below the ground surface. After considering several methods of representing the stress-strain and damping properties of soil, a method using equivalent linear moduli with variable Rayleigh damping is considered best for a wide range of situations. (USBR)
W73-09667

STABILITY OF ROCKFILL IN END-DUMP RIVER CLOSURES,
Alberta Univ., Edmonton.
B. P. Das.
Proc Am Soc Civ Eng, J Hydraul Div, Vol 98, No HY11, p 1947-1967, Nov 1972. 21 p, 6 fig, 3 tab, 22 ref, 2 append.

Descriptors: *Construction, *Hydraulics, *Rock fills, Stability, Rockfill dams, Cofferdams, Alluvial channels, Flow, Laboratory tests, River flow, Velocity, Constrictions, Bibliographies, Canada.
Identifiers: *River closures, Foreign studies.

Closure of a river is necessary to divert the flow prior to any construction on the bed. One method is to end-dump loose material, such as rockfill, from one or both banks to constrict the waterway progressively and ultimately block the channel. However, the usual methods of determining stable closure material size by correlation with either mean velocity through the gap or velocity near the boundary are not realistic. Since most major hydraulic structures are sited at the submountain stage, where the river has an alluvial bed, stability of materials on end-dump closure dams built into alluvial channels was investigated. Closure material stability was defined numerically by a parameter efficiency of the material, denoting the ratio of the volume of material remaining in the body of the dam to the volume dumped at any stage. Analysis of all relevant parameters indicated that essential interrelated nondimensional variables describing stability are: (1) Froude number of approach flow, (2) contraction ratio, (3) ratio of closure material size to the approach flow depth, and (4) efficiency of closure material. Functional relationships of these variables were established by laboratory studies. Practicable design curves to determine stable size of closure material are presented. (USBR)
W73-09670

LIQUID FAILURE.
American Wood Preservers Inst., McLean, Va.
Wood Preserving, Vol 50, No 8-9, p 7-15, Aug-Sept 1972. 9 p, 1 map, 6 photo, 2 tab, 9 chart, 4 ref.

Descriptors: *Soil compaction, Soil stability, Sands, Soil density, Soil investigations, Soil engineering, Soil mechanics, Cohesionless soils, Seismic studies, *California.
Identifiers: Niigata Earthquake (Japan), Vibroflotation, *Compaction piles, Soil liquefaction, Compaction piles, Treasure Island (Calif), Earthquake damage.

At Treasure Island, a hydraulically placed sandfill was determined to be in danger of liquefaction failure in event of a major earthquake. The sandfill extends from the ground surface to a depth of about 45 ft and the ground-water level is 6 ft below the ground surface. Between depths of 15 to 25 ft, some sand was at low relative densities of 25 to 30%, considerably below the 70% desired for safety from liquefaction. Methods considered to increase sand density included: (1) increasing the confining stress by adding more fill, (2) increasing the confining stress by lowering the ground-water level, (3) grouting, (4) excavating and compacting, (5) using sand compaction piles, and (6) vibroflotation. Sand compaction piles used at one building site were found unsatisfactory because sand density was both nonuniform and difficult to measure. At other sites, 20-ft-long nonstructural displacement piles were driven completely below the water table. Sand was compacted by conventional methods above the water table. The nonstructural piles method was simpler, easier to specify, open to all bidders, easier to determine density increases, and less expensive than other effective methods. (USBR)
W73-09675

WAHKIAKUM COUNTY CONSOLIDATED DIKING DISTRICT NO. 1, WAHKIAKUM COUNTY, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
Available from National Technical Information Service, U.S. Dept. of Commerce as EIS-WA-74-5280-F, for $5.50 paper copy, $0.95 microfiche. June 1972. 37 p, 1 map, 1 photo.

Descriptors: *Washington, *Flood control, *Levees, *Project planning, *Environmental effects, Levee districts, Diversion structures, Ditches, Dikes, Flood damage, Flood protection, Project purposes, Stagnant water, Wildlife, Wildlife habitats, Ecology, Dredging, Landfills, Water management (Applied), Wildlife conservation.
Identifiers: *Columbia River (Wash.), *Environmental impact statement, Borrow ditches.

The proposed action is construction of various improvements to correct deficiencies in the existing levee system on Puget and Little Islands in the Columbia River, Washington. The project's purpose is to secure a higher degree of safety from flooding for the diking district. The project will prevent flooding in the project area, reduce flood damages resulting from levee failure and seepage, and eliminate stagnant water areas. The project would also eliminate the habitat of ducks, pheasants, furbearers and small birds with a consequent reduction in population of these animals. Alternatives considered were a levee of a different height and a levee in a different location, but neither were felt to provide sufficient flood control. Implementation of the proposed action is not expected to alter existing agricultural practices; however, residential development will probably accelerate. Reduction of wildlife population will be long-term. The only commitment of resources is the conversion of wet borrow ditches created at the time of original levee construction into dry

sand fill. However, the ditches could be redredged to create a habitat similar to that which is destroyed. The comments of various governmental and private agencies are included in the statement. (Reed-Florida)
W73-09697

8E. Rock Mechanics and Geology

USE OF ACOUSTIC LOGGING TECHNIQUE FOR DETERMINATION OF INTERGRAIN CEMENTATION PROPERTIES,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 08G.
W73-09242

HYDRAULIC FRACTURING AND THE EXTRACTION OF MINERALS THROUGH WELLS,
Wisconsin Univ., Madison. Dept. of Minerals and Metals Engineering.
B. Haimson, and E. J. Stahl.
In: Third Symposium on Salt, Vol 2; Northern Ohio Geological Society Publication, p 421-432, 1970. 19 fig, 2 tab, 8 ref.

Descriptors: *Rock mechanics, *Injection wells, *Stress, *Strain, *Cracks, Fractures (Geologic), Rock properties, Elasticity (Mechanical), Deformation, Rupturing, Mechanical properties, Failure (Mechanics).
Identifiers: *Hydraulic fracturing.

Hydraulic fracturing is a method used to create artificial fractures for the purpose of increasing flow capacity around a well or enhancing communication between two adjacent wells. The fractures are theoretically assumed to be tensile ruptures extending in a plane perpendicular to the direction of the smaller horizontal principal compressive stress. The pressures required to initiate and extend vertical fractures depend on the principal tectonic stresses, the porous-elastic parameters of the rock and on tensile strength. Experimental work on simulated wells in laboratory rock samples under triaxial loading is described. Results confirm theoretical predictions of fracture type, fracture initiation pressure and fracture orientation. In the field, oriented impression packers were used to determine the fracture azimuth at the well bore. Wells belonging to a common field yielded hydraulic fractures of approximately same orientation. This substantiates the theoretical and laboratory conclusion that the smallest tectonic horizontal compressive stress direction determines the fracture orientation. (Knapp-USGS)
W73-09288

INITIATION AND EXTENSION OF HYDRAULIC FRACTURES IN ROCKS,
Minnesota Univ., Minneapolis.
B. Haimson, and C. Fairhurst.
Society of Petroleum Engineers Journal, Vol 7, No 3, p 310-318, September 1967. 7 fig, 14 ref.

Descriptors: *Rock mechanics, *Injection wells, *Stress, *Strain, *Cracks, Fractures (Geologic), Rock properties, Elasticity (Mechanical), Deformation, Rupturing, Mechanical properties, Failure (Mechanics).
Identifiers: *Hydraulic fracturing.

A criterion is proposed for the initiation of vertical hydraulic fracturing taking into consideration the three stress fields around the wellbore. These fields arise from (1) nonhydrostatic regional stresses in earth, (2) the difference between the fluid pressure in the wellbore and the formation fluid pressure, and (3) the fluid flow from the wellbore into the formation. The wellbore fluid pressure required to initiate a fracture is a function of the elastic constants of the rock, the horizontal principal regional stresses, the tensile strength of the rock, and the formation fluid pressure. A constant injection rate will extend the fracture to a point where equilibrium is reached and then, to keep the fracture open, the pressure required is a function of the elastic constants of the rock, the component of the regional stress normal to the plane of the fracture, the formation fluid pressure, and the dimensions of the crack. The same expression may also be used to estimate the vertical fracture width, provided all other variables are known. The equations for the initiation and extension pressures in vertical fracturing may be employed to solve for the two horizontal, regional, principal stresses in the rock. (Knapp-USGS)
W73-09289

REAL STRESSES AROUND BOREHOLES,
Wisconsin Univ., Madison.
B. C. Haimson, and T. M. Tharp.
Preprint of Paper SPE 4241; prepared for 6th Conference on Drilling and Rock Mechanics January 22-23, 1973, Austin, Tex: Society of Petroleum Engineers Preprints, p 107-116, 1973. 5 fig, 3 tab, 12 ref.

Descriptors: *Rock mechanics, *Injection wells, *Stress, *Strain, *Cracks, Fractures (Geologic), Rock properties, Elasticity (Mechanical), Deformation, Rupturing, Mechanical properties, Failure (Mechanics).
Identifiers: *Hydraulic fracturing.

Generally the internal pressure required to rupture a borehole is higher than the expected tensile strength of the rock. The tangential stresses around holes as developed according to linear elasticity appear to be deceptively high. Rock is nonlinear in its elastic behavior. When linearized for purpose of mathematical analysis the slope of the stress-strain curve in compression is most often higher than in tension. Recalculation of the stresses around a circular hole based on the assumption of bilinearity reveals severe discrepancies between the real stresses developed and those apparent from linear elastic solutions. The results obtained can be directly applied to calculations of allowable pressures in wellbores (during drilling or hydraulic fracturing), pressure tunnels and boreholes. Stresses around circular holes in bilinear rock are a function of the material elastic properties, unlike the linear case. (Knapp-USGS)
W73-09290

STATIC FRACTURING OF ROCK AS A USEFUL TOOL IN MINING AND ROCK MECHANICS,
Wisconsin Univ., Madison.
B. C. Haimson.
In: Rock Fracture; Proceedings of International Symposium on Rock Mechanics, October 4-6, 1971, Nancy, France: International Society for Rock Mechanics, Part II, Paper II-30, 1971. 10 fig, 2 tab, 10 ref.

Descriptors: *Rock mechanics, *Injection wells, *Stress, *Strain, *Cracks, Fractures (Geologic), Rock properties, Elasticity (Mechanical), Deformation, Rupturing, Mechanical properties, Failure (Mechanics).
Identifiers: *Hydraulic fracturing.

Static or hydraulic fracturing of rock by means of borehole pressurization is a versatile technique of stimulating oil production, improving salt and potash extraction, disposing of waste materials, storing gas, and determining in-situ stresses at any depth. To understand this fracturing phenomenon, a theory relating fracturing fluid pressures and fracture orientation to the principal in-situ stresses and directions was developed. Laboratory testing results are given which verify most of the theoretical assumptions and criteria. Results from oil-field and underground mine tests show that the method is suitable for in-situ stress determination. Results of routine hydraulic fracturing jobs in an oil field could be used to estimate in-situ stresses. Experimental work indicates that mechanically induced notches play an important role in directing the fracture at least in the neighborhood of the borehole. This result could be used in enhancing communication between wells in solution mining. (Knapp-USGS)
W73-09291

8F. Concrete

CEMENTING GEO-THERMAL STEAM WELLS.
Dow Chemical Co., Tulsa, Okla. Dowell Div.

1972. 8 P, 5 TAB, APPEND.

Descriptors: Wells, *Grouting, Silica, *Cement grouting, Cements, Steam, Slurries, Technology, Well data, Compressive strength, Density.
Identifiers: *Geothermal wells, *Portland cement, Pressure grouting, Bottom-hole temperature.

Cement, once in place in a geo-thermal well, is expected to support the pipe, preventing channelling by forming a hydraulic seal, and remain competent under producing conditions. It is recommended that a minimum of 30% fine silica sand be used in all cement systems placed in geo-thermal wells, in order to minimize the decrease in compressive strength and increase in permeability of portland cement suffered while in high temperature use, a phenomenon commonly referred to as strength retrogression. Guidelines for selecting a cement system and appropriate technique are given; good cementing practices are listed, including the use of centralizers, hole conditioning, cooldown, bottom plugging, etc. Tables are given which contain typical data on primary cement systems recommended for use in cementing geo-thermal wells. It is recommended, however, that laboratory tests under actual well conditions on the materials to be used should be the basis for the final job design. (Campbell-NWWA)
W73-09252

CEMENTING FUNDAMENTALS.
Dow Chemical Co., Tulsa, Okla. Dowell Div.

1972. 11 P.

Descriptors: *Cements, *Cement grouting, Cellulose, *Additives, Wells, Materials, Grouting, Sealants, Slurries, Equipment, Drilling, Rotary drilling, Technology.
Identifiers: Barite, Accelerators (Cement), Retarders (Cement), Antifoam agents.

The overall mechanism of cementing pipe in a well appears to be rather simple; however, the tremendous amount of technology which has been developed and the research which is continually in progress proves that cementing wells is more a science than an art. Additives, which are used to alter the properties of the basic cement-water mixture known as neat cement are discussed, including weighting materials, extenders, accelerators, retarders, lost circulation materials, and special additives. Special additives include: fine sand to control strength loss in high-temperature applications, antifoam agents, dispersants, radioactive materials (for logging purposes) and fluid loss materials. Pieces of auxiliary equipment are listed and the purpose of each is explained. These include: float collars and shoes, centralizers, scratchers, casing wiper plugs, and cement heads. (Smith-NWWA)
W73-09253

SYSTEMATIC STRESS ANALYSIS OF CIRCULAR PIPE,
Naigai Engineering Co., Tokyo (Japan).
J. Katoh.

Proc Am Soc Civ Eng, Transp Eng J, Vol 98, No TE4, p 1039-1063, Nov 1972. 25 p, 10 fig, 6 tab, 3 append.

Descriptors: *Loads (Forces), *Stress analysis, *Concrete pipes, Deformation, Pipelines, Pipes, Structural analysis, Stress, Numerical analysis, Shear, Cracks.
Identifiers: *Pipe design, Foreign studies, Japan.

Despite increasing demands for concrete pipes in sewer and irrigation systems, stress analysis of pipes usually depends on approximate formulas because of complex rational analysis. For small pipes, sufficient factors of safety may cover deficiencies and cause little difference in results. However, for larger pipes, probability of crack growth inside the crown and bottom of large reinforced concrete pipes requires closer analysis of lateral deformation of pipe and behavior of lateral soil reaction. The principles described facilitate a more rational design by permitting simple, systematic analysis and calculation of the section force or deformation. Using tables presented of arbitrary load and reaction systems, simple calculations can be made to obtain values for the bending moment, shear, and axial force at any point in the pipe. Pipe deformation is useful for analyzing lateral resistance of the fill, evaluating concrete strength in the pipes, and predicting crack growth. Methods of computing deformation are given which closely follow general derivation. (USBR)
W73-09669

8G. Materials

ANALYSIS OF CATHODIC PROTECTION CRITERIA,
Hawaii Univ., Honolulu.
D. A. Jones.
Corrosion, Vol 28, No 11, p 421-423, November, 1972. 4 fig, 8 ref.

Descriptors: Corrosion, *Corrosion control, *Cathodic protection, Electrochemistry, Anodes, Reduction (Chemical), Cathodes, Steel structures, *Graphical analysis, Electrolytes.
Identifiers: Corrosion cell, *Aqueous corrosion, Polarization potential (Electrical), Tafel constant, Nernst equation.

The criterion of cathodic protection is that level of cathodic potential change (polarization) which is sufficient to give adequate protection for a given application. Ideally, it is preferred to polarize to the reversible potential of the anodic reaction, but this potential is often impossible to determine by experiment or to calculate from theory for complex corrosive electrolytes. Polarization to a specific potential (e.g.-0.85 volts) or to various potential changes (e.g., 100 to 300 mv) have also been proposed but none have been universally accepted. Electrochemical kinetic theory has been very successful in predicting and correlating the corrosion behavior of metals. However, the theory has not been applied to cathodic protection until recently. It has been shown that the anodic Tafel constant determines the cathodic polarization necessary to effect a given reduction in corrosion rate. Thus, polarization required to obtain a given degree of protection can be predicted if the anodic Tafel constant is known. Determining the anodic Tafel constant may be difficult for complex structures in service. However, even an estimate from a small sample in the required corrosive would be very helpful in making the criterion of cathodic protection more quantitative. (Campbell-NWWA)
W73-09239

CHEMISTRY OF GRAIN BOUNDARIES AND ITS RELATION TO INTERGRANULAR CORROSION OF AUSTENTITIC STAINLESS STEEL,
Brookhaven National Lab., Upton, N.Y.
A. Joshi, and D. F. Stein.
Corrosion, Vol 28, No 9, p 321-330, September 1972. 10 fig, 2 tab, 37 ref.

Descriptors: *Corrosion, Steel, *Stainless steel, Electronic equipment, *Chromium, Nickel, Nitrogen, Phosphorous, Alloys, Sulfur, Silicon, Heat treatment.
Identifiers: *Intergranular corrosion, *Electron spectroscopy, Annealing, Nitric acid, Fractographs.

The basis of intergranular corrosion in austenitic stainless steels in examined by relating the grain boundary composition to the corrosion properties. The technique of Auger electron spectroscopy has been used to obtain the chemistry of intergranular fracture surfaces. It was found that the chromium depleted zones exist and that the depletion theory was valid for tests in weakly oxidizing solutions. In highly oxidizing solutions, however, the impurity segregation and not chromium depletion best explains the deterioration of corrosion properties. Impurity elements such as sulfur, silicon, nitrogen, and phosphorous were observed in the various steels examined. An attempt is made to explain the observed corrosion properties on the basis of chromium depletion and solute segregation theories combined with an electrochemical mechanism. (Smith-NWWA)
W73-09240

USE OF ACOUSTIC LOGGING TECHNIQUE FOR DETERMINATION OF INTERGRAIN CEMENTATION PROPERTIES,
Continental Oil Co., Houston, Tex.
A. M. Zanier, and H. L. Overton.
Paper presented at Eleventh Annual Logging Symposium, p K1-K12, 1970. Society of Professional Well Log Analysts, Houston, Texas, 7 fig, 2 tab, 12 ref.

Descriptors: Logging (Recording), Wells, *Acoustics, Shear, Shear stress, Porosity, Elasticity (Mechanical), Compressibility, *Rock properties, Shear strength, Well data.
Identifiers: *Dilatational waves, *Wave velocity, Cementation, Formation evaluation.

The acoustic velocity of the dilatational and the shear waves in rocks increases as the hydrostatic pressure incerases. However, the rate of increase of velocity is different for dilatational than for shear waves. For dilatational waves, the rate of velocity is a function of packing of the grains, while for shear, the rate of increase is a function of shear coupling. The shear waves are sensitive to the cementing material in the rocks, while the dilatational waves are mainly dependent upon the grains' properties. A theoretical exponent has been derived and tested experimentally in the laboratory on various rocks. Dilatational and shear wave test have been made and bulk compressibility and shear strength recorded under confining conditions. The tests indicate that a relation exists between this exponent and the 'cementationfactor'. From the scope picture of the acoustic pulse, it is possible to determine the exponent, along with porosity and elastic properties of the rock in place. (Campbell-NWWA)
W73-09242

ROLE OF THE ALLOYING ELEMENTS AT THE STEEL/RUST INTERFACE,
Centro Sperimentale Metallurgico S.p.A., Rome (Italy).
R. Bruno, A. Tamba, and G. Bombara.
Corrosion, Vol 29, No 3, March, 1973, p 95-99, 8 fig, 1 tab, 19 ref.

Descriptors: *Alloys, Corrosion, Analysis, *Steel, *Rusting, Copper, Chromium, Phosphorus, Nickel, *Oxidation, Oxides, Steel structures, Materials.
Identifiers: Atmospheric moisture, Polarization, Carbon steel, *Self-protection.

Three low alloy steels and an ordinary carbon steel were investigated as to the distribution of the alloy elements (Cu, Cr, P, Ni) in rust coverings produced either by weathering or by slight anodic oxidation. Electron microprobe examinations of rust showed, besides an overall enrichment in the alloy elements, the presence of sharp concentration peaks in layers some ten um wide. The more resistant the steel to atmospheric corrosion, the higher the rust to steel concentration gradient and the closer the concentration peaks to the steel/rust interface. Corrosion potential and polarization measurements in O.1M Na2SO4 on rusted specimens evidenced a marked effect of the interfacial enrichment in increasing the anodic polarizability and the tendency to a coverage passivation. This leads to looking upon the corrosion generated steel/rust interface as directly contributing, in addition to the rust itself, to the self protection of low alloy steels during atmospheric corrosion. (Smith-NWWA)
W73-09261

DEVELOPMENT OF LOW COST, CORROSION RESISTANT ALLOYS AND OF ELECTROCHEMICAL TECHNIQUES FOR THEIR PROTECTION IN DESALINATION SYSTEMS,
Tyco Labs., Inc., Waltham, Mass.
F. H. Cocks, A. H. Taylor, and S. B. Brummer.
Available from the National Technical Information Service as PB-215 265, $6.75 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report, No 801, December 1972. 227 p, 123 fig, 25 tab, 104 ref. 14-01-0001-1730.

Descriptors: *Desalination, *Corrosion, Metallurgy, Electrochemistry, *Copper Alloys, *Corrosion control, *Alloys.
Identifiers: Heat-treatment, Yield strengths, Anodic protection.

A corrosion - resistant alloy of the Cu-Zn-Ni-Al family has been developed for desalination systems. Modified by the addition of Fe and Mn, the alloys can be fabricated soft and thermally treated to impart a yield strength in excess of 140 000 psi. In a 268 deg F saline solution an improvement in corrosion resistance over arsenical aluminum brass by a factor of three was noted. Also studied were means to protect the alloy, and others commercially available, by anodic protection techniques. (OSW)
W73-09631

FINITE ELEMENT ANALYSES OF STRESSES AND MOVEMENTS IN DAMS, EXCAVATIONS AND SLOPES (STATE-OF-THE-ART),
California Univ., Berkeley.
For primary bibliographic entry see Field 08D.
W73-09666

APPLICATIONS OF FINITE ELEMENT ANALYSES IN SOIL DYNAMICS (STATE-OF-THE-ART),
California Univ., Berkeley.
For primary bibliographic entry see Field 08D.
W73-09667

A TALK ON THE FINITE ELEMENT METHOD AND GEOTECHNICAL ENGINEERING IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Denver, Colo.
H. W. Anderson.
Paper, Appl Finite Elem Method Geotech Eng, Proc Symp, Vicksburg, Miss, May 1972, p 131-154, Sept 1972. 24 p, 10 fig, 14 ref.

Descriptors: *Finite element analysis, Engineering geology, Foundations, Soil mechanics, Rock mechanics, Stress analysis, Concrete dams, Earth dams, Rockfill dams, Structural analysis, Flow nets, Computer models, Dynamics, Rock foundations, Rock excavation, Deformation.

Identifiers: Grand Coulee Dam, Auburn Dam (Calif), Nonlinear properties, Foundation models, Computer graphics, Computer-aided design.

The Bureau of Reclamation began using the finite element method in 1962, when a stability analysis was performed for the underground chamber of Morrow Point Dam Powerplant. As the years passed, the Bureau applied the method to many analytical problems including in situ rock, concrete dams, earth and rockfill dam foundations, structures and flow nets. Results of Grand Coulee Forebay Dam foundation analyses were useful in determining the amount of concrete treatment necessary in a fault zone under the dam, for checking the adequacy of the proposed foundation drainage system, and for determining the stability of the dam foundation along a major joint system. Static analyses of stresses and deformations in earth and rockfill dams are made using a program that models the sequential construction of embankments and the nonlinear, stress-dependent behavior of the materials. As applications to larger problems grew, methods to simplify input of data improved with automatic generation of the finite element mesh and much of the input data. Improving the materials analysis to allow truly representative values and comparing actual structural behavior with predicted behavior are areas in which more work should be done. (USBR)
W73-09668

SYSTEMATIC STRESS ANALYSIS OF CIRCULAR PIPE,
Naigai Engineering Co., Tokyo (Japan).
For primary bibliographic entry see Field 08F.
W73-09669

CONSIDERATIONS OF PIPELINE TENSION TIE PROBLEMS,
Santa Clara County Flood Control and Water District, San Jose, Calif.
L. C. Fowler, R. P. Lundahl, and R. W. Purdie.
Proc Am Soc Civ Eng, Transp Eng J, Vol 98, No TE4, p 969-984, Nov 1972. 16 p, 7 fig, 8 tab, append.

Descriptors: *Pipelines, *Hydrostatic pressure, Joints (Connections), Shear, Strain, Tension, Structural design, Tensile stress, Strain gages, *California.
Identifiers: *Bolted joints, *Pipe joints, Santa Clara County (Calif), Lugs, Couplings, Flexible couplings.

The Santa Clara County Flood Control and Water District recently completed construction of more than 44 mi of pressure pipeline, ranging from 20 to 84 in. in diameter. The joint harness type tension tie was used extensively on these pipelines at flexible coupling locations where unbalanced internal forces occurred. During preliminary hydrostatic tests, 2 types of joint failures occurred at 5 locations. The first resulted when the tension tie nut and washer pulled through the back plate of the harness lug. The joint was repaired by replacing all plate lugs with new 1/2-in.-thick plate lugs twice as thick as the originals. In the second, the joint harness lug tore a section of pipe wall at the heel of the lug along the periphery of the lug to pipe weld. Satisfactory repairs were made by installing a 3/8-in. steel wrapper plate over the failed section of the pipe and welding new tension tie lugs on the wrapper plate. These failures, their possible causes, and recommendations for minimizing similar occurrences are discussed. Strain gage data obtained from field tests of 3 joint harness connections and calculated strains and stresses are presented in an appendix. (USBR)
W73-09671

LABORATORY LOAD TESTS ON BURIED FLEXIBLE PIPE,
Bureau of Reclamation, Denver, Colo.
A. K. Howard.
Journal of the American Water Works Association, Vol 64, No 10, Part 1, p 655-662, Oct 1972. 8 p, 12 fig, 3 tab, 8 ref.

Descriptors: *Laboratory tests, *Steel pipes, Deflection, Elastic deformation, Deformation, Structural behavior, Soil density, Clays, Research and development, Soil pressure, Strain measurement, Buckling.
Identifiers: *Flexible pipes, *Buried pipes, *Pipe tests.

Investigations were undertaken to determine soil-structure interaction of buried pipe. Steel pipe 18, 24, and 30 in. in diameter with wall thicknesses of 7, 10, and 14 gage for each diameter was buried in a large soil container for loading with a large universal testing machine. Nine pipes were tested with backfill soil placed at 90% Proctor maximum dry density, and 5 were tested at 100% Proctor. Four pipes buckled elastically at vertical deflections of less than 8%. Tests on 5 others, after the first 10-psi surcharge, produced good correlations with the Iowa formula for flexible pipe design. Under deflection, pipe took either an elliptical or rectangular shape, depending upon the relationship between pipe stiffness and soil stiffness. Elliptical pipe deformation created high compressive strains on the inner pipe surface at the horizontal diameter. Rectangular pipe deformation showed such strains at 45, 135, 225, and 315 deg points from the vertical axis. Pressures at the sides of the pipe were about 100-150% of the surcharge pressure for elliptically deformed pipe and 50-100% for rectangularly deformed pipe. (USBR)
W73-09674

TOTAL THERMAL ANALYSIS: POLYMERS AS A CASE IN POINT,
Owens-Illinois, Inc., Toledo, Ohio.
G. W. Miller.
Materials Research Standards, Vol 12, No 10, p 10-21, Oct 1972. 13 p, 25 fig, 27 ref.

Descriptors: *Differential thermal analysis, *Polymers, *Materials testing, Heat, Heat treatment, Temperature, Microscopy, Quality control, Measurement, Crystallization, Thermal expansion, Tensil properties, Bolumetric analysis, Deformation, Laboratory tests, Bibliographies, Calorimeters.
Identifiers: Transition, Thermogravimetric method, Dilatometers.

Thermal analysis has been identified with the techniques of differential thermal analysis (DTA), differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA). Application of linear heating rates, increased amplification, and reliable quantification to these techniques have made them extremely useful to the materials scientist. Availability of highly sensitive transducers has promoted commercialization of reliable thermal mechanical analyzers. New thermal analysis techniques using polymers are discussed and correlated with old methods. Each new technique produces a specific response for further defining the structural behavior of polymers. Calorimetric or thermometric measurements complement these techniques in monitoring and controlling material properties for routine applications. To reliably interpret polymer behavior, specific modes of thermal analysis should be used. (USBR)
W73-09676

8I. Fisheries Engineering

BIOMASS AND PRODUCTION OF CARP FRY IN DIFFERENTLY FERTILIZED FINGERLING PONDS,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 05C.
W73-09187

BIASED HARVEST ESTIMATES FROM A POSTAL SURVEY OF A SPORT FISHERY,
Wisconsin Dept. of Natural Resources, Waupaca.
R. F. Carline.
Trans Am Fish Soc. Vol 101, No 2, p 262-266. 1972. Illus.
Identifiers: Fishery, *Postal surveys, Salvelinus-fontinalis, *Sport fishery, Surveys, *Brook trout.

A partial creel census and a postal card survey were simultaneously employed to determine the harvest of wild brook trout (Salvelinus fontinalis) from several ponds. A comparison of the catch per effort ratios (c/e) from interviews and postcards revealed a positive bias in the estimates obtained from returned postcards. The c/e ratios from postcards were double the c/e ratios from interviews. This discrepancy was partly due to the reluctance of unsuccessful anglers to return postcards. There was a significantly higher proportion of unsuccessful anglers from interviews than from postcard returns. Positive errors in the c/e ratios also resulted from a nonresponse of successful anglers and from more than one fisherman reporting on a single card. Estimates of fishing success from postcards seriously overestimated the season's harvest of trout and the exploitation rates.--Copyright 1973, Biological Abstracts, Inc.
W73-09229

EVALUATION OF THE CONTRIBUTION OF SUPPLEMENTAL PLANTINGS OF BROWN TROUT SALMO TRUTTA (L.) TO A SELF--SUSTAINING FISHERY IN THE SYDENHAM RIVER, ONTARIO, CANADA,
Guelph Univ. (Ontario). Dept. of Zoology.
T. J. Millard, and H. R. MacCrimmon.
J Fish Biol. Vol 4, No 3, p 369-384. 1972. Illus.
Identifiers: *Canada (Ontario), Fishery, Rivers, Salmo-Trutta, *Sydenham River (Ont.), *Trout (Brown).

An autumn planting of 4000 tagged yearling S. trutta (L.) in 1969 resulted in an over-winter survival of 26%, an angler recovery the following year of 8.1% and made up 22% of the March, 1970 standing population of the species. Aug. standing populations of brown trout increased from 142 trout/ha (17.6 kg/ha) in 1969 to 360 trout/ha (39.3 kg/ha) in 1970 while angler harvest of the species increased from 61 trout/ha (12.7 kg/ha) at a rate of 0.26 fish/h to 89 trout/ha (18.5 kg/ha) at a rate of 0.34/h. Using angler recovery and standing population as criteria the planting contributed substantially to the fishery. Actual contribution of stocked trout however, is questioned after detailed analysis of resident population structure and the potential of natural recruitment. It is suggested that the true benefit of stocked trout may be measured by the presence of those stocked fish in excess of the number of resident trout of that size predictable from a normal length distribution curve in waters with self-sustaining populations. Complexities in evaluating the merits of supplemental plantings of hatchery-reared brown trout to existing stream fisheries are examined.--Copyright 1973, Biological Abstracts, Inc.
W73-09285

DEVELOPMENT OF A SPORT FISHERY FOR LANDLOCKED SALMON IN A RECLAIMED POND,
Maine Dept. of Inland Fisheries and Game, Bangor.
K. Warner.
Prog Fish-Cult. Vol 34, No 3, p 133-140. 1972.
Identifiers: *Fish management, Development, Fishery, Osmerus mordax, Ponds, Salmo salar, *Salmon, *Maine.

A 108-acre mesotrophic lake in northern Maine was reclaimed with toxaphene in 1961 to evaluate the possibility of establishing a landlocked salmon (Salmo salar) fishery, with rainbow smelts (Osmerus mordax) as forage in ponds previously considered too small for salmon management, and

to evaluate factors affecting success. Initial salmon plantings failed to survive, but salmon were established by 1964, the third year after reclamation. After 5 unsuccessful eyed-egg plantings were made, smelts became established by 1968. Of 13 spp. present prior to reclamation, 7 spp. were eradicated and 2 others are probably no longer present. Because heavy salmon stocking and late establishment of smelts threatened salmon growth rate, length and bag limits were liberalized in 1966, resulting in a heavy harvest of salmon. Salmon growth improved to above average by 1969-71, attributable to establishment of an abundant smelt population, reduced salmon stocking, and a moderate salmon harvest. A high quality salmon fishery is presently being provided under existing conditions. The advantages and constraints of salmon management in similar habitats are discussed.--Copyright 1973, Biological Abstracts, Inc.
W73-09419

RELATION BEWTEEN FOOD CONSUMPTION AND FOOD SELECTIVITY IN FISHES: II. EXPERIMENTAL STUDY ON THE FOOD SELECTION BY JUVENILE GUPPY (POECILIA RETICULATA) (IN JAPANESE),
Kawaga Univ., Takamatsu (Japan). Inst. of Biology.
T. Sunaga.
Jap J Ecol. Vol 21, No 1/2, p 67-70, 1972. Illus. (English summary).
Identifiers: Cyclops-Vicinus, Daphnia-Pulex, *Fishes (Food), *Juvenile, Guppy, *Poecilia-Reticulata.

A series of experiments using the juvenile P. reticulata was made under laboratory conditions to examine how the feeding rate of a fish can be affected by the intensity of food selection. Throughout the experiments, the guppy was placed in a 2-1 nylon screen basket suspended into a glass aquarium. Alive specimens of Daphnia pulex cultured in the laboratory and Cyclops vicinus collected from a reservoir were filtrated with a nylon screen net (1.2 mm in mesh). The filtrated plankters were mixed in various ratios and supplied to the fish. Juvenile guppy seemed to prefer D. pulex more than C. vicinus. The feeding rate (number of food specimen in the fish intestine/fish body weight/hr) for D. pulex increased significantly with an increase in number of the plankters supplied. In the case of C. vicinus such an increase of feeding rate as in the former species was not observed, and the feeding rate increased in accordance with the decrease of number of D. pulex given together. The total feeding rate (sum of D. pulex and C. vicinus) of guppy increased accompanied by the increase of the total number of plankters supplied. The greater the proportion of D. pulex to C. vicinus in plankters supplied, the higher the total feeding rate occurred.--Copyright 1972, Biological Abstracts, Inc.
W73-09504

SPAWNING OF THE AMERICAN SHAD, ALOSA SAPIDISSIMA IN THE LOWER CONNECTICUT RIVER,
Essex Mar. Lab., Conn.
C. Barton, Jr.
Chesapeake Sci. Vol 13, No 2, p 116-119, 1972. Illus.
Identifiers: Alosa-Sapidissima, Connecticut River, Rivers, *Shad (American), *Spawning.

Eggs were collected using plankton nets in the lower 54 mi of the Connecticut River during 1967 and 1968 to locate spawning areas of American shad and to determine environmental factors influencing spawning success. Spawning occurred between 13 and 27 June, the peak being June in 1967 and May in 1968. Shad spawned throughout the study area, but primarily above mile 28. Based on egg age and river flows, most eggs could have traveled 1 to 4 mi from the spawning sites. Shad arrived earlier in 1968 and spawned earlier and further downstream than in 1967, possibly due to warmer temperatures in May 1968. Lower water temperature in June 1968 may have contributed to the higher egg mortality observed in that year (18% in 1967 and 30% in 1968). Most eggs in 1968 (65%) were collected in temperatures lower than 16.0C, as opposed to only 3% in 1967. Other investigators have shown that shad eggs developing at these low temperatures have a prolonged development and reduced survival; the paucity of juveniles collected in 1968 gave supporting evidence for a weakened year class.--Copyright 1972, Biological Abstracts, Inc.
W73-09543

EVIDENCE ON THE INFLUENCE OF THE COPEPOD (SALMINCOLA CALIFORNIENSIS) ON THE REPRODUCTIVE PERFORMANCE OF A DOMESTICATED STRAIN OF RAINBOW TROUT (SALMO GAIRDNERI),
California Univ., Davis. Dept. of Animal Science.
G. A. E. Gall, E. L. McClendon, and W. E. Schafer.
Trans Am Fish Soc. Vol 101, No 2, p 345-346, 1972.
Identifiers: *Copepods, *Rainbow trout, Reproduction (Trout), Salmincola-Californiensis, Salmo-Gairdneri, *Fish eggs (Trout).

Egg number and egg size of hatchery-raise rainbow trout before and after eradication of this copepod parasite are analyzed.--Copyright 1973, Biological Abstracts, Inc.
W73-09556

SOME FACTORS ASSOCIATED WITH FLUCTUATION IN YEAR-CLASS STRENGTH OF SAUGER, LEWIS, AND CLARK LAKE, SOUTH DAKOTA,
Bureau of Sport Fisheries and Wildlife, Yankton, S. Dak. North Central Reservoir Investigations.
For primary bibliographic entry see Field 02H.
W73-09558

MINERAL COMPOSITION OF OREGON PELLET PRODUCTION FORMULATIONS,
Oregon State Univ., Astoria. Seafoods Lab.
D. L. Crawford, and D. K. Law.
Prog Fish-Cult. Vol 34, No 3, p 126-130. 1972.
Identifiers: *Fish diet, Fish hatchery, *Minerals, Oregon, *Pellet production.

The mineral composition of 2 Oregon pellet production formulations was determined. Four variations in the wet fish fraction composition for each formulation were included. Formulations were charcterized as to proximate composition. Levels of total ash, P, K, Ca, Mg, Na, Al, Sr, Fe, B, Cu, Zn, and Mn were determined. The success of these formulations under hatchery conditions seems to support the supposition that essential minerals in required amounts are available from these formulations for good growth.--Copyright 1973, Biological Abstracts, Inc.
W73-09561

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

A LOOK BACK AT THE FIRST SEVEN YEARS OF WYO. WRRI (1965-1971),
Wyoming Univ., Laramie. Water Resources Research Inst.
P. A. Rechard.
Available from the National Technical Information Service as PB-220 251, $3.00 in paper copy, $0.95 in microfiche. Water Resources Series No 35, March 1973. 51 p, 2 append. OWRR A-001-WYO (64).

Descriptors: *Research and development, *Water resources Institute, Publications, *Education, Administration, *Wyoming, Training, Colleges, *Universities.

The organization, role, program, and accomplishments of the University of Wyoming Water Resources Research Institute are reviewed. The individuals involved with the WRRI are recognized and the publications resulting from the first seven years of operations are listed.
W73-09108

DIRECTORY OF FACULTY ENGAGED IN WATER RESEARCH AT CONNECTICUT UNIVERSITIES AND COLLEGES,
Connecticut Univ., Storrs. Inst. of Water Resources.
W. C. Kennard, and M. S. Williams.
Available from the National Technical Information Service as PB-220 246, $3.00 in paper copy, $0.95 in microfiche. Report No 17, October 1972, 36 p, 2 tab, append. OWRR A-999-CONN (12)

Descriptors: *Education, *Universities, *Connecticut, *Scientific personnel, Research and development, Water resources.
Identifiers: *Directories.

In order to determine the extent of interest at academic institutions in water-related research, a survey of the 21 colleges and universities in the state of Connecticut was conducted. Results of the survey were used to compile this directory. Eighteen out of the 21 reporting institutions had faculty in water research, representing a total of 186 individuals. Faculty was classified according to department, institution and subject matter. Of the 38 academic departments represented, the social sciences of law, economics and political science comprise less than 10%, the biological sciences more than 25%, the engineering sciences, along with the earth sciences and chemistry, approximately 14% each. Lesser percentages from a wide range of subjects such as Art, Pathobiology, Journalism, Statistics and Elementary Education formed the remaining 23%. The directory will be of value to people throughout the state who are concerned with the proper management and development of water resources in Connecticut. In addition, greater exchange of information and ideas among staff members at academic institutions in the state should occur. (Edelen-Connecticut)
W73-09112

WATER RESOURCES RESEARCH AT THE UNIVERSITY OF MARYLAND, 1965-1972,
Maryland Univ., College Park. Water Resources Research Center.
R. L. Green.
Water Resources Research Center Research Report, 1972. 38 p, 3 fig, 5 tab, 25 ref. OWRR A-999-MD (7).

Descriptors: *Water Resources Research Act, *Water resources institute, *Universities, *Maryland, Research and development, Chesapeake Bay, Bibliographies, Reviews.

The Water Resources Research Center (WRRC) was established at the University of Maryland in the spring of 1965. Its Interdisciplinary Advisory Committee includes a chemical engineer, a soil physicist, a recreationist, a sociologist, a biologist and an economist. The water oriented activities of the state are primarily in the eastern shore, southern Maryland areas on the waterfront of the Chesapeake Bay, other smaller bays and the Potomac River and their tributaries. The demands on Maryland water resources are from the competitive uses for transportation, recreation, commercial fishing, agriculture and industrial uses including cooling water for electric power generators. Research by the Water Resources Research Center is summarized, and a bibliography of completed reports is presented. (Knapp-USGS)

W73-09267

A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.
For primary bibliographic entry see Field 06E.
W73-09708

WATER RESOURCES RESEARCH INSTITUTE.
For primary bibliographic entry see Field 06E.
W73-09717

9B. Education (In-House)

A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.
For primary bibliographic entry see Field 06E.
W73-09708

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES RESEARCH AT THE UNIVERSITY OF MARYLAND, 1965-1972,
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 09A.
W73-09267

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

THE GEOPHYSICAL DIRECTORY, (TWENTY--EIGHTH EDITION 1973).
For primary bibliographic entry see Field 03E.
W73-09256

10C. Secondary Publication And Distribution

WEATHER MODIFICATION: PRECIPITATION INDUCEMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 03B.
W73-09114

USE OF NATURALLY IMPAIRED WATER, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 03C.
W73-09116

A SELECTED ANNOTATED BIBLIOGRAPHY OF THE CLIMATE OF THE GREAT LAKES,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
For primary bibliographic entry see Field 02H.
W73-09149

TRITIUM AND ITS EFFECTS IN THE ENVIRONMENT--A SELECTED LITERATURE SURVEY,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05C.
W73-09433

SEA GRANT NEWSLETTER INDEX, 1968-71,
Rhode Island Univ., Narragansett. Pell Marine Science Library.
For primary bibliographic entry see Field 02L.
W73-09598

REPORTS FOR CALIFORNIA BY THE GEOLOGICAL SURVEY WATER RESOURCES DIVISION,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02E.
W73-09603

10F. Preparation of Reviews

LEAD IN SOILS AND PLANTS: A LITERATURE REVIEW,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 05B.
W73-09479

SIGNIFICANCE OF MERCURY IN THE ENVIRONMENT,
Department of Agriculture, Saskatoon (Saskatchewan). Research Station.
For primary bibliographic entry see Field 05B.
W73-09511

EVALUATION OF MEASUREMENT METHODS AND INSTRUMENTATION FOR ODOROUS COMPOUNDS IN STATIONARY SOURCES. VOLUME 1—STATE OF THE ART,
Esso Research and Engineering Co., Linden, N.J. Government Research Div.
For primary bibliographic entry see Field 05A.
W73-09601

BIOLOGICAL ASPECTS OF OIL POLLUTION IN THE MARINE ENVIRONMENT, A REVIEW,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
For primary bibliographic entry see Field 05C.
W73-09643

FINITE ELEMENT ANALYSES OF STRESSES AND MOVEMENTS IN DAMS, EXCAVATIONS AND SLOPES (STATE-OF-THE-ART),
California Univ., Berkeley.
For primary bibliographic entry see Field 08D.
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For primary bibliographic entry see Field 08D.
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A. Centers of Competence		
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University of Florida, Eastern U. S. Water Law	W73-09692 -- 09701 09704 -- 09748	55
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University of Wisconsin, Water Resources Economics	W73-09409 -- 09413	5
U. S. Geological Survey, Hydrology	W73-09101 -- 09103 09105 09121 -- 09170 09267 -- 09276 09278 -- 09280 09282 -- 09284 09286 -- 09299 09430 -- 09435 09437 -- 09466 09585 -- 09619	155
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B. State Water Resources Research Institutes		
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Ocean Engineering Information Service	W73-09384 -- 09408	25
Office of Saline Water	W73-09623 -- 09641	19
Office of Water Resources Research	W73-09110 09114 -- 09116 09118 -- 09120	7

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

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